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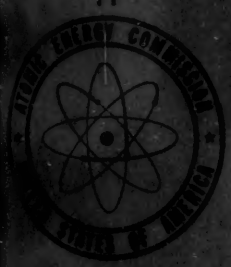

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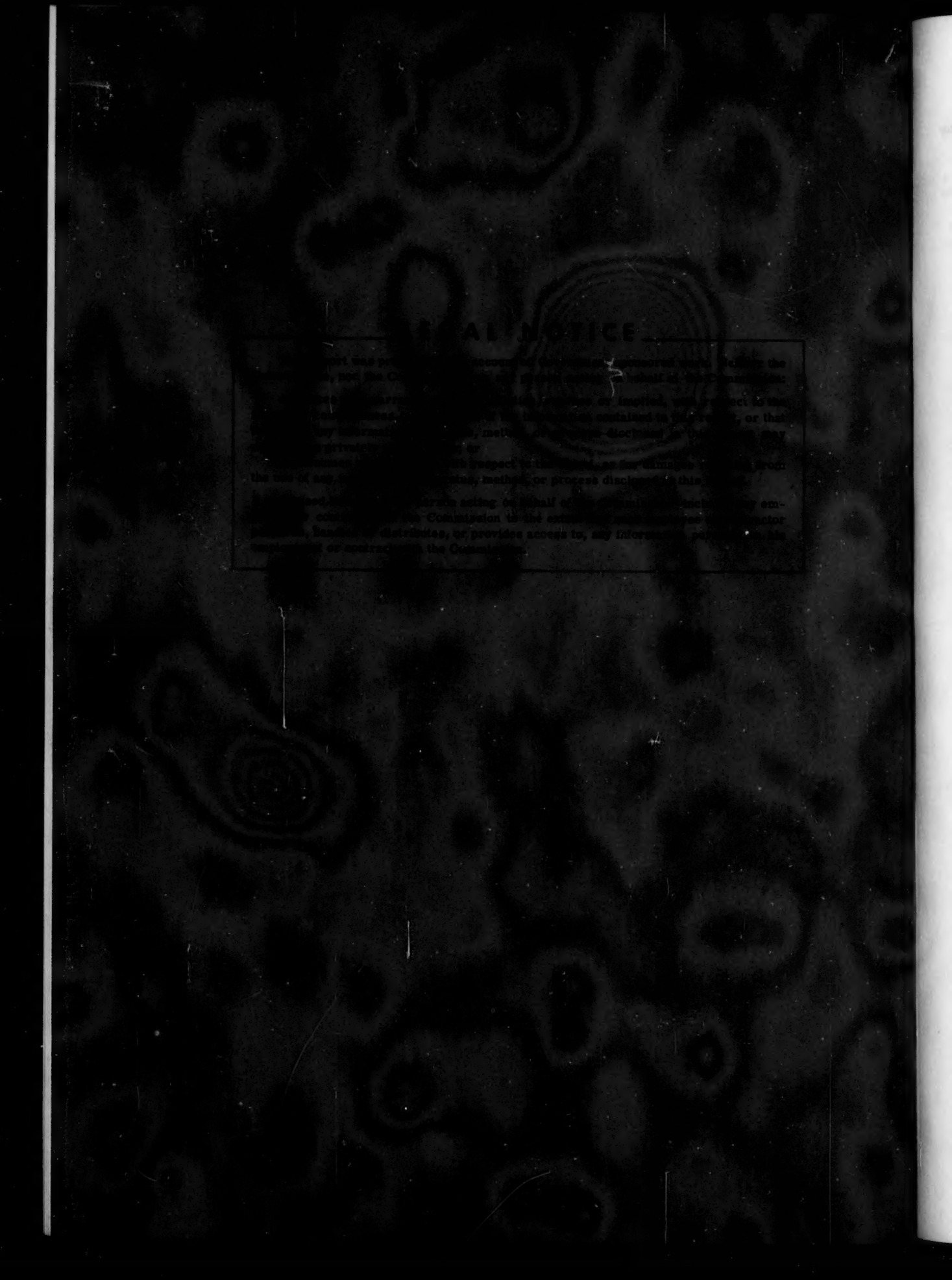

NUCLEAR SCIENCE ABSTRACTS

Volume 11 June 30, 1957 No. 12A

GENERAL

ATOMIC POWER

6185 TID-7527
Oak Ridge Inst. of Nuclear Studies, Inc., Tenn.
PROCEEDINGS OF THE CONFERENCE ON ENGINEERING EDUCATION AND NUCLEAR ENERGY HELD AT GATLINBURG, TENNESSEE, SEPTEMBER 5-8, 1956. W. W. Grigorieff, ed. 206p. $1.00(OTS).

Papers are included on the scientific manpower needs in atomic energy programs, the ORSORT curriculum, the educational program at Argonne National Laboratory, and educational programs in nuclear science at various universities. (B.J.H.)

6186
ENGINEERING PROBLEMS OF NUCLEAR POWER. 1. Claude D. Gibb (C.A. Parsons and Co., Ltd., Newcastle upon Tyne). Atomics 8, 124-6(1957) Apr.

The problems in the design and use of nuclear reactors and reactor components are briefly discussed. (B.J.H.)

6187
CHEMICAL ASPECTS OF NUCLEAR POWER. 1. CHEMISTRY AND METALLURGY. F. S. Martin (A.E.R.E., Harwell). Atomics 8, 127-30, 147(1957) Apr.

Some aspects of the collaboration between chemistry and metallurgy in the nuclear industry are briefly discussed. (B.J.H.)

6188
BERKELEY. A PROGRESS REPORT. BRISK TEMPO AT CEA POWER STATION SITE. Nuclear Power 2, 142-3 (1957) Apr.

Progress on the construction of the power station is briefly described. (W.L.H.)

6189
ATOMS FOR THE WORLD. Laura Fermi. Chicago, The University of Chicago Press, 1957. 235p. $3.75.

A popular account is given of the International Conference on the Peaceful Uses of Atomic Energy, Geneva, 1955. Topics such as the historical events leading to the conference and the problems in organizing the conference are also covered. (B.J.H.)

BIOLOGY AND MEDICINE

6190 AEC-tr-2856
RELATIONSHIP BETWEEN THE PROCESSES OF RECONSTRUCTION AND DISTRIBUTION OF MINERALS IN BONE. I. INVESTIGATION CONDUCTED WITH THE METHOD OF STUDY OF ABSORPTION OF ROENTGEN RAYS. Rodolfe Amprino. Translated from Z. Zellforsch. u. mikroskop. Anat. 37, 144-83(1952). 57p.

6191 AEC-tr-2884
THE QUESTION OF THE POSSIBILITY OF "RADIOSYNTHESIS." S. I. Kuznetsov. Translated by V. Beak from Mikrobiologiya 25, 195-9(1956). 12p.

The thermal effect of radioactive decay is compared with the energy requirements for biosynthesis of organic matter from $CO_2 + H_2O$. The impossibility of naturally occurring "radiosynthesis" is shown. (T.R.H.)

6192 AEC-tr-2902
THE FINE STRUCTURE OF ELASTIC TISSUE. AN ELECTRON OPTICAL AND X-RAY STUDY. G. F. Bahr and A. Engstrom. Translated by N. Willis from Verhandl. Anat. Ges.; Ergänzungsheft Anat. Anz. 101, 197-204 (1954-55). 5p.

Methods of preparing elastic tissue for x-ray and electron microscope study are reviewed. The composition and structure of the "cementing substance" of connective tissue is discussed. (T.R.H.)

RADIATION EFFECTS

6193 AEC-tr-2844
EFFECT OF RADIATION FROM A COBALT ISOTOPE ON THE QUALITY OF THE ROOTS OF THE SUGAR BEET. F. M. Polishchuk. Translated from Sakharnaya Prom. 30, 54-5(1956). 5p.

6194
EFFECTS OF X-IRRADIATION ON RENAL FUNCTION OF RATS. L. H. Smith and W. R. Boss (Syracuse Univ., N. Y.). Am. J. Physiol. 188, 367-70(1957) Feb.

6195
ACUTE LETHALITY OF MICE AS INFLUENCED BY THE PERIODICITY OF PAIRED EXPOSURES TO FAST NEUTRONS OR X RAYS. G. S. Melville, Jr., F. P. Conte, M. Slater, and A. C. Upton (Oak Ridge National Lab., Tenn.). Brit. J. Radiol. 30, 196-9(1957) Apr.

6196
THE RESPONSE OF EXPLANTED HUMAN TUMORS TO RADIATION. Shields Warren and Olive Gates (Harvard Univ. and New England Deaconess Hospital, Boston, Mass.). Cancer Research 17, 163-6(1957) Apr.

6197
THYROID NEOPLASMS IN THE RAT: A COMPARISON OF NATURALLY OCCURRING AND I^{131}-INDUCED TUMORS. Stuart Lindsay, G. D. Potter, and I. L. Chaikoff (Univ. of California School of Medicine, Berkeley). Cancer Research 17, 183-9(1957) Apr.

6198
HISTOPATHOLOGY OF THE NERVOUS SYSTEM AT DIFFERENT PERIODS OF ACUTE RADIATION SICKNESS. A. G. Beglaryan, K. A. Kyandaryan, and S. A. Papoyan (Armenian Ministry of Health, Research Inst. of Roentgenology and Oncology). Doklady Akad. Nauk S.S.S.R. 112, 422-6(1957) Jan. 21. (In Russian)

6199
FURTHER STUDIES ON THE EFFECTS OF X-RADIATION ON THE MULTIPLICATION OF RICKETTSIA MOOSERI IN EMBRYONATE EGGS. Donald Greiff, E. L. Powers, and Henry Pinkerton (St. Louis Univ., Mo. and Argonne National Lab., Lemont, Ill.). J. Exptl. Med. 105, 217-22 (1957) Mar.

6200
THE EFFECT OF X-RAYS ON THE RICKETTSIOSTATIC ACTIVITY OF STREPTOMYCIN, AUREOMYCIN, AND

PENICILLIN. Donald Greiff, E. L. Powers, and Henry Pinkerton (St. Louis Univ., Mo. and Argonne National Lab., Lemont, Ill.). J. Exptl. Med. 105, 223-32(1957) Mar.

6201
EFFECT OF 500 r WHOLE BODY IRRADIATION ON THE CELLULAR COMPOSITION OF THE PERITONEAL FLUID FOLLOWING AN INTRAPERITONEAL INJECTION OF ANTIGEN IN MICE. R. S. Speirs (Brookhaven National Lab., Upton, N. Y.). J. Immunol. 77, 437-43(1956) Dec.

6202
USE OF GAMMA RADIATION FOR THE DESTRUCTION OF WOOD-BORING INSECTS. J. D. Bletchly and Ronald C. Fisher (Forest Products Research Lab., Aylesbury, Bucks). Nature 179, 670(1957) Mar. 30.

6203
LETHAL AND STERILIZING EFFECTS OF GAMMA RADIATION ON INSECTS INFESTING CEREAL COMMODITIES. P. B. Cornwell, L. J. Crook, and J. O. Bull (Atomic Energy Research Establishment, Harwell, Berks). Nature 179, 670-2(1957) Mar. 30.

6204
THYROID ADENOMAS IN SHEEP ADMINISTERED IODINE-131 DAILY. L. K. Bustad, S. Marks, L. A. George, Jr., and L. J. Seigneur (General Electric Co., Richland, Wash.). Nature 179, 677(1957) Mar. 30.

6205
SHORTENING OF LIFE IN THE OFFSPRING OF MALE MICE EXPOSED TO NEUTRON RADIATION FROM AN ATOMIC BOMB. W. L. Russell (Oak Ridge National Lab., Tenn.). Proc. Natl. Acad. Sci. U. S. 43, 324-9(1957) Apr.

6206
THE EFFECT OF RADIATION ON THE ESOPHAGUS. William B. Seaman and Lauren V. Ackerman (Washington Univ. School of Medicine, St. Louis). Radiology 68, 534-41 (1957) Apr.

6207
ACTION OF IONIZING RADIATION ON THE ORGANISM. A. Lacassagne and G. Gricouroff. Paris, Masson & Cie, 1956. 201p. (In French)

RADIATION HAZARDS AND PROTECTION

6208 AF-SAM-56-111
Texas. Univ., Austin. Radiobiological Lab.
PROLONGATION OF SULFHYDRYL PROTECTION IN IRRADIATED MICE. Joe E. Smith. Apr. 27, 1956. 5p.

6209 KAPL-1615
Knolls Atomic Power Lab., Schenectady, N. Y.
RADIOLOGICAL DEVELOPMENT ACTIVITIES IN HEALTH PHYSICS. Semiannual Progress Report [for] January–June 1956. L. J. Cherubin and J. J. Fitzgerald. 45p. Contract W-31-109-Eng-52. $0.35(OTS).

An evaluation was made of optimum particle size and face velocities for the penetration of $KMNO_4$ particles through millipore filters. An investigation was made of the rate of deposition of debris resulting from a liquid NaK-water reaction. An analysis was made of the dispersion rate and subsequent fall-out of fluorescent particles from the roof of a critical assembly. An automatic fall-out sampler was constructed to provide a means for determining the number of size characteristics of particles falling out from a cloud at finite periods after generation. The radio-operated on-off switch for an air sampler was tested for the radio control of portable air samplers. The energy dependence of the Cutie Pie and Juno radiation survey meters was determined using beta sources evaluated for surface dose rate by means of an extrapolation chamber. The feasibility of using a thyroid scintillation monitor as a quick, relatively sensitive, and accurate external monitor of the internal dose from the inhalation or ingestion of fission products following a nuclear (power reactor) incident was investigated. A method was investigated for the radiochemical determination of Th in urine. A study on the radioactivity of samples of a quatic life in the Mohawk River was continued. Criteria and methods for evaluating credible reactor hazards to the environs were developed to simplify the assessment of reactor hazards. Data are tabulated. (For preceding period see KAPL-1572.) (C.H.)

6210 NRL-4886
Naval Research Lab., Washington, D. C.
FALLOUT PROTECTION AFFORDED BY STANDARD ENLISTED MEN'S BARRACKS. C. W. Malich and L. A. Beach. Jan. 7, 1957. 23p. Project NY 340-032.

The shielding properties of standard Navy enlisted men's barracks have been calculated for the gamma radiation associated with fallout from nuclear weapons. Potential improvements in shielding have been investigated. The major benefit of present barracks is the possibility of the prevention of deposition of radioactive material on personnel, if doors and windows are kept closed during fallout. In addition, the gamma-ray dose is reduced about one half inside the building by keeping the radioactivity outside, and the shielding of the walls gives a further reduction in dose of a factor of two. There is no large variation in average dose throughout most of the building. Most of the radiation is transmitted through the doors and windows. Improvements in shielding are incompatible with economy and with pleasant routine living. An enlarged, properly designed basement is suggested for emergency quarters. (auth)

6211 NYO-4861
New York Operations Office. Health and Safety Lab., AEC.
ENVIRONMENTAL RADON CONCENTRATIONS. Interim Report. Harold Glauberman and A. J. Breslin. Mar. 1957. 11p. $3.30(ph OTS); $2.40(mf OTS).

Preliminary data showing ambient concentrations of radon in the Metropolitan New York area are presented. An attempt has been made to define the variability of concentration of radon in the general atmosphere with location, time, and weather conditions. Samples have been analyzed from the outdoor air, inside of buildings, and above and below the surface of the ground. Comparisons with the data obtained by other investigators are also shown. (auth)

6212 PB-121784
Robert A. Taft Sanitary Engineering Center, Cincinnati.
RADIOLOGICAL HEALTH HANDBOOK. Simon Kinsman, comp. and ed. Jan. 1957. 358p.

This edition of the handbook contains a large amount of readily available information of interest to anyone working in the field of radiation. Sections are included on physical, chemical, and mathematical data; radioisotope, decay, and radioassay data, radiation protection data. A list of all the radioactive and stable isotopes of the elements, together with a number of their salient features including decay schemes is given. A glossary, a subject index, and a list of references are included. (C.H.)

6213 SC-4073
Sandia Corp., Albuquerque, N. Mex.
ESTIMATING SAFETY PROBABILITIES FROM FALLOUT FORECASTS FOR NEVADA TEST SITE. Jack W. Reed. Feb. 1957. 23p. $4.80(ph OTS); $2.70(mf OTS).

Available data on wind persistence and wind forecasting capability have been applied in estimating the probability of a fallout pattern shifting from an uninhabited safe sector into a populated region. Safety probability is computed from wind variability, forecasting accuracy, initial height

and particle size of radioactivity landing at a point in the predicted fallout pattern, predicted wind speed, length of forecast period, and safe-sector angular width. (auth)

6214
EFFECTIVE ROENTGEN REDUCTION: AN INDEX OF ANTIBIOTIC THERAPY OF THE ACUTE RADIATION SYNDROME. Sol M. Michaelson and Joe W. Howland (Univ. of Rochester, N. Y.). Antibiotics Annual 936-41 (1956-1957).

6215
MODIFICATION OF ACUTE IRRADIATION INJURY IN RATS BY DEXTRAN. H. Blondal (Univ. of Manitoba, Winnipeg, Can.). Brit. J. Radiol. 30, 219-22(1957) Apr.

RADIOTHERAPY

6216
RADIATION SIALITIS FOLLOWING RADIOIODINE THERAPY. A. W. G. Goolden, J. R. Mallard, and H. E. A. Farran (Hammersmith Hospital, London and New End Hospital, London). Brit. J. Radiol. 30, 210-12(1957) Apr.

6217
RADIOACTIVE PHOSPHORUS. III. IN THE TREATMENT OF MALIGNANT LYMPHOMAS, PLASMA-CELL MYELOMA, EWING'S SARCOMA, AND OSTEOGENIC SARCOMA. Henry D. Diamond, Lloyd F. Craver, and Helen Q. Woodard (Memorial Center for Cancer and Allied Diseases, New York). Cancer 10, 143-50(1957) Jan.-Feb.

6218
DISTRIBUTION AND EFFECT OF COLLOIDAL CHROMIC PHOSPHATE (P^{32}) INJECTED INTO THE HEPATIC ARTERY AND PORTAL VEIN OF DOGS AND MAN. Bennett Levine, Henry Hoffman, and Samuel O. Freedlander (Mount Sinai Hospital, Cleveland, Ohio). Cancer 10, 164-72(1957) Jan.-Feb.

6219
SOME PHYSICAL CONSIDERATIONS GOVERNING THE CHOICE OF INTERNALLY ADMINISTERED RADIOISOTOPES FOR THERAPY. M. Berman, J. E. Rall, and J. Heslin (Sloan-Kettering Inst., New York). Phys. in Med. and Biol. 1, 243-57(1957) Jan.

6220
RELATION OF TUMOR SIZE TO RADIORESISTANCE. Charles M. Nice, Jr. (Univ. of Minnesota Medical School, Minneapolis). Radiology 68, 555-7(1957) Apr.

6221
RADIOAKTIVE ISOTOPE IN KLINIK UND FORSCHUNG, BAND II. VORTRAGE AM GASTEINER INTERNATIONALEN SYMPOSION 1956 (Radioisotopes in Clinic and Research – Lectures at the Gastein International Symposium, 1956). K. Fellinger and H. Vetter, eds. Berlin, Urban and Schwarzenberg, 1956. 296p. (In German and English)

Refer also to abstract 6474.

TOXICOLOGY STUDIES

6222 GAT-184(Rev. 1)
Goodyear Atomic Corp., Portsmouth, Ohio.
A STUDY OF THE FLUORIDE CONCENTRATION IN THE SCIOTO RIVER AND TRIBUTARY STREAMS. H. L. Burkhardt, H. L. Caterson, B. Kalmon, and R. A. Manning. Apr. 1, 1957. 14p. Contract AT(33-2)-1. $0.20(OTS).

As part of the program of insuring that dangerous or obnoxious waste materials are not discharged from the Portsmouth area gaseous diffusion plant, GAT maintains a program of monitoring the plant waste water for fluoride content. This program was inaugurated in August 1954. Monitoring points are located along the Scioto River, both above and below plant site, and along the tributary streams into which plant waste water is discharged. Fluoride content of the Scioto River as reported in two surveys by the U. S. Public Health Service, prior to the operation of the plant, is compared to the fluoride data obtained by the GAT monitoring program. Calculations using these data are made to show the effect of plant effluent on the fluoride content of the Scioto River. (auth)

TRACER APPLICATIONS

6223 AEC-tr-2867
ON THE BEHAVIOR OF RADIOACTIVE FISSION PRODUCTS IN SOIL. THEIR ABSORPTION BY PLANTS AND THEIR ACCUMULATION IN CROPS. V. M. Klechkovskii (Klechkovsky), ed. Translated from a Publication of the Academy of Science, U.S.S.R., [1956]. (Moscow–Leningrad). 227p.

Results are presented from a series of studies on the interaction of radioactive fission products with soils, absorption of fission product by plants, and their accumulation in agricultural crops. (C.H.)

6224
THE METABOLISM OF RADIONUCLIDES BY MARINE ORGANISMS. I. THE UPTAKE, ACCUMULATION, AND LOSS OF STRONTIUM^{89} BY FISHES. Howard Boroughs, Sidney J. Townsley, and Robert W. Hiatt (Univ. of Hawaii, Honolulu). Biol. Bull. 111, No. 3, 336-51(1956) Dec.

6225
THE METABOLISM OF RADIONUCLIDES BY MARINE ORGANISMS. II. THE UPTAKE, ACCUMULATION, AND LOSS OF YTTRIUM^{91} BY MARINE FISH, AND THE IMPORTANCE OF SHORTLIVED RADIONUCLIDES IN THE SEA. Howard Boroughs, Sidney J. Townsley, and Robert W. Hiatt (Univ. of Hawaii, Honolulu). Biol. Bull. 111, No. 3, 352-7(1956) Dec.

6226
PHYSIOLOGY AND TOXICOLOGY OF TRITIUM IN MAN. Ernest A. Pinson and Wright H. Langham (Los Alamos Scientific Lab., N. Mex.). J. Appl. Physiology 10, 108-26 (1957) Jan.

6227
TURN-OVER OF CARRIER-FREE ZIRCONIUM-89 IN MAN. John Mealey, Jr. (Harvard Medical School and Massachusetts General Hospital, Boston). Nature 179, 673-4(1957) Mar. 30.

6228
BIOLOGICAL CONCENTRATION BY KILLER CLAMS OF COBALT-60 FROM RADIOACTIVE FALLOUT. Herbert V. Weiss and William H. Shipman (U. S. Naval Radiological Defense Lab., San Francisco, Calif.). Science 125, 695 (1957) Apr. 12.

Refer also to abstract 6471.

CHEMISTRY

6229 AD-108091
Baylor Univ., Waco, Tex.
THE ELECTROCHEMISTRY OF LOW VALENCES OF TITANIUM. Quarterly Progress Report for December 1, 1955 to March 1, 1956. Thomas C. Franklin and Haig Verne Seklemian. Mar. 1, 1956. 14p. Contract AF33 (616)-3331.

Preliminary experiments on the anodic dissolution of Ti, carried out primarily in acetonitrile and dimethylformamide solutions, showed that Ti usually dissolved as Ti^{4+} or Ti^{3+}. In three runs the results indicated that Ti went into solution in the divalent form. However, it was felt that this was caused by a reaction in which some component in the solvent oxidized Ti^{2+} faster than the electrode did. (auth)

6230 AERE-C/R-933(Del.)
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
COUNTER-CURRENT LIQUID-LIQUID EXTRACTION IN ANNULUS COLUMNS WITH SHEARING MOTION. R. Spence and R. J. W. Streeton. Sept. 22, 1952. Decl. with deletions Dec. 18, 1956. 45p.

The rotary extractor has been investigated both from the point of view of mechanism of operation and from the point of view of utility for the extraction of U. It has been shown that there is a hyperbolic relationship between h/d and d/R_1 (where R_1 is the radius of the rotor, d is the width of the annulus, and h is the height of a single vortex). The height of equivalent theoretical stage (H.E.T.S.) varies as the cube root of the cross sectional area (hd) of the vortices and combination of these two relationships gives an expression for the H.E.T.S. in terms of R_1 and d, viz: H = const. $(d^4 + R^2/3)^{1/4}$. The expression holds over the whole of the range of sizes studied (R_1 = 0.075–6.66 cm.; d = 0.05–1.6 cm.). The rate of transfer of $UO_2(NO_3)_2$ across the interface between drops and continuous phase in the butex-aqueous system has been found to depend on the transport of the solvated $UO_2(NO_3)_2$ molecule through a solvent film at the interface. The rate of transfer in the case of a single drop in the rotary column is only about twice that which is found for a drop falling freely through a static continuous phase. (auth)

6231 CCC-1024-TR-233
Michigan. Univ., Ann Arbor.
LOW-TEMPERATURE HEAT CAPACITY AND THERMODYNAMIC PROPERTIES OF SODIUM METHOXIDE. E. F. Westrum, Jr., and G. Grenier. Mar. 26, 1957. 9p. [For Callery Chemical Co. Contract NOa(s)-52-1024-c].

Heat capacities of sodium methoxide from 5 to 345°K were measured. The heat-capacity curve has the normal sigmoid shape except for a small deflection of undetermined origin near 34°K. This deflection involves an excess entropy of about 0.43 calorie per mole per degree. The following thermodynamic functions at 298.16°K were determined (molal values): heat capacity at constant pressure, 16.60 ± 6 calories; and free-energy function, −15.12 ± 0.03 calories per degree. (auth)

6232 CCC-1024-TR-234
Callery Chemical Co., Penna.
CONVERSION OF BORIC OXIDE TO BORON TRICHLORIDE. R. K. Pearson, T. W. Platt, J. C. Renforth, R. J. Shreve, N. J. Sheetz, L. L. Lewis, L. J. Edwards — P. M. Maginnity, ed. Apr. 2, 1957. 11p. Contract [NOa(s)-52-1024-c].

Boron trichloride was produced in screening reactions of B_2O_3 with C and $SiCl_4$, PCl_3, and SCl. Compounds that failed to convert B_2O_3 to detectable quantities of chlorinated boron compounds were HCl, NH_4Cl, methyl chloride, phosgene, phosphorus oxychloride, and chlorosulfonic acid. No B–Cl bonds appeared to be formed by reactions of B_2O_3 with the chlorides of Na, Ca, Hg^{2+}, Zn, Fe^{3+}, and As^{3+}. Neither HCl nor NaCl reacted with sodium tetraborate to form chlorinated B compounds. Trimethoxyboroxin was not completely converted to chlorinated compounds by reaction with chlorine or phosgene; and LiCl and trimethoxyboroxin gave no BCl_3. (auth)

6233 CCC-1024-TR-235
Callery Chemical Co., Penna.
REACTIONS OF PENTABORANES WITH SODIUM AMALGAM OR SODIUM HYDRIDE. M. D. Ford, W. V. Hough, L. J. Edwards, — P. M. Maginnity, ed. Apr. 5, 1957. 8p. Contract [NOa(s)-52-1024-c].

Neither sodium amalgam nor sodium hydride reacted with pentaborane(9) in ethyl ether at room temperature. The complex reaction of sodium amalgam with pentaborane(11) in ethyl ether at room temperature was incompletely defined, although formation of some NaB_3H_8 was verified. Pentaborane(11) decomposed in the ether more rapidly than it reacted with the sodium. (auth)

6234 CEA-569
France. Commissariat à l'Énergie Atomique, Paris.
BROYAGE DE BORE ELEMENT ET DOSAGE DE CARBURE DE BORE DANS LE BORE. (Pulverization of Boron Element and Proportions of Boron Carbide in Boron). F. M. Lang and C. Finck. June 26, 1956. 6p.

The pulverization of B by means of a mortar and pestle made of sintered B_4C with the introduction of less than 1% B_4C into the B is discussed. (W.L.H.)

6235 NYO-7008
Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy.
GALVANIC CELLS FOR THE DETERMINATION OF THE STANDARD MOLAR FREE ENERGY OF FORMATION OF METAL HALIDES, OXIDES, AND SULFIDES AT ELEVATED TEMPERATURES. Technical Report [on] THERMODYNAMICS OF METAL SOLUTIONS. Kalevi Kiukkola and Carl Wagner. Aug. 15, 1956. 32p. Contract AT(30-1)-1002, Scope I. $0.25(OTS).

The use of electromotive force measurements on galvanic cells for the determination of standard molar free energies of formation of halides, oxides, sulfides, and other compounds at elevated temperatures is surveyed. New potentialities and inherent limitations are shown. Formulas for the estimate of errors resulting from electronic conduction and from transference of the components of electrolytes between different activity levels are derived. (auth)

6236 NYO-7009
Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy.
MEASUREMENTS ON GALVANIC CELLS INVOLVING SOLID ELECTROLYTES. Technical Report [on] THERMODYNAMICS OF METAL SOLUTIONS. Kalevi Kiukkola and Carl Wagner. Aug. 15, 1956. 41p. Contract AT(30-1)-1002, Scope I. $0.30(OTS).

Electromotive force measurements on galvanic cells involving solid electrolytes have been made in order to obtain the standard molar free energy of formation of CoO, NiO, Cu_2O, Ag_2Se, PbS, and several phases of the system Ag–Te at elevated temperatures. (auth)

6237 NYO-7705
Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy.
THE ADAPTATION OF NEW RESEARCH TECHNIQUES TO MINERAL ENGINEERING PROBLEMS. Progress Report. Jan. 31, 1957. 41p. Contract AT(30-1)-956. (MITS-34). $0.30(OTS).

(For preceding period see NYO-7699.)

6238 AEC-tr-2861
A METHOD OF INVESTIGATING EQUILIBRIA IN REACTIONS OF FORMATION OF CARBIDES FROM OXIDES AT HIGH TEMPERATURES. V. S. Kutsev, B. F. Orlova, and V. A. Engelbaum. Translated from Zhur. Fiz. Khim. 29, 629-34(1955). 9p.

A method of investigating the equilibria in the reactions of formation of carbides at high temperatures has been worked out. The method described allows experiments to be performed on amounts of up to 5 g thus giving enough material for subsequent analysis by chemical and x-ray methods. By comparison with the methods in the literature the precision of the measurements of the equilibrium pressure is increased by one order of magnitude. (auth)

6239 AEC-tr-2871

ENTRAINMENT OF IMPURITIES DURING CRYSTALLIZATION. Jules Pauly. Translated by K. S. Bevis from Ann. phys. 1, 1003-39(1956). 34p.

Entrainment of foreign ions was studied on crystallized KNO_3, starting with an aqueous solution or with a molten salt. Using radioelements as indicators, it was possible to follow the entrainment for extremely small amounts of impurity. Results showed that purity is the same for small as for large crystals. (W.L.H.)

6240

THERMOLYSIS OF THORIUM PRECIPITATES. SALTS OF ORGANIC ACIDS. Wesley W. Wendlandt (Texas Technological Coll., Lubbock). Anal. Chem. 29, 800-2(1957) May.

The thermal decomposition of the Th precipitates with stearic, pyrogallic, m-hydroxybenzoic, m-cresoxyacetic, benzoic, 2,4-dichlorophenoxyacetic, phenylacetic, cinnamic, and o-aminobenzoic acids, and mercaptothiazole were studied on the thermobalance. In general, the precipitates decomposed at fairly low temperatures. The least stable began to lose weight at 35° C, while the most stable exhibited no weight loss below 285° C. The oxide levels were obtained in the temperature range from 450° to 675° C. (auth)

6241

THE EFFECT OF VOLUME AND TEMPERATURE ON THE ENERGY AND ENTROPY OF PURE LIQUIDS. Scott E. Wood, Oscar Sandus, and Stanley Weissman (Illinois Inst. of Tech., Chicago). J. Am. Chem. Soc. 79, 1777-82(1957) Apr. 20.

The change of the potential energy of a liquid with temperature has been considered in two steps, the change with temperature at constant volume and the change with volume at constant temperature. The assumption is made that the position and momentum variables are separable. These considerations show that the potential energy of non-polar liquids is more dependent upon the volume than upon the temperature. Similar results are obtained for that part of the entropy which may be associated with the position and orientation of the molecules in the liquid. The values of the change with volume of the parameter, a, defined by the equation $E = E_0 + a/V$, are markedly different for many liquids in the normal range of volume while those of the change with temperature are about the same order of magnitude. A study is made of this dependency on volume. (auth)

6242

WARMING CURVES FOR THE CONDENSED PRODUCT OF DISSOCIATED WATER VAPOR AND FOR HYDROGEN PEROXIDE GLASS. John A. Ghormley (Oak Ridge National Lab., Tenn.). J. Am. Chem. Soc. 79, 1862-5(1957) Apr. 20.

Water vapor dissociated in an electric discharge and condensed at −196° forms a glassy product which yields O_2 gas and H_2O_2 solution when warmed. Warming curves for the discharge product are significantly different from those exhibited by H_2O_2 solution after it has been frozen rapidly to form a glass. The discharge product partially crystallizes between −110 and −75°, and the resulting crystalline phase begins to melt at about −70°. When warmed to −60° the liquid bubbles violently, evolving O_2, and the temperature suddenly rises as much as 120°. The resulting H_2O_2 solution when cooled rapidly to −196° forms a glass which crystallizes starting at about −110° with an abrupt rise in temperature to −56°, a eutectic for the $H_2O_2-H_2O$ system. This difference in thermal behavior is interpreted as further evidence for the existence at low temperatures of an unidentified species such as H_2O-O, H_2O_3 or H_2O_4. The O_2 evolution reaction is exothermal by about 44 kcal./mole. (auth)

6243

NIOBIUM AND TANTALUM PENTACHLORIDES AND THEIR BINARY SYSTEM. J. B. Ainscough, R. J. W. Holt, and F. W. Trowse (U.K.A.E.A., Industrial Group, Springfields Works, Preston, Lancs.). J. Chem. Soc. 1034-7 (1957) Mar.

The boiling points of $NbCl_5$ and $TaCl_5$ have been measured over a range of pressures. At 760 mm pressure they were found to be 247.4° ± 0.1° and 232.9° ± 0.1° respectively, and the heats of vaporization were calculated at 12.6 and 13.1 kcal $mole^{-1}$ respectively. The triple points have been determined as 203.4° ± 0.2° and 215.9° ± 0.1° respectively. The liquid-vapor equilibrium in the system $NbCl_5-TaCl_5$ has been examined and the relative volatility ($TaCl_5 : NbCl_5$) at atmospheric pressure found to be 1.36 over the whole range of mixture compositions. (auth)

6244

THE SZILARD-CHALMERS REACTION IN ETHYL BROMIDE. Miriam Milman and P. F. D. Shaw (Clarendon Lab., Oxford). J. Chem. Soc. 1303-10(1957) Mar.

The nature of the reactions following neutron capture by the bromine atom in ethyl bromide has been investigated by analyzing the products at different free bromine concentrations. The products from the processes associated with the slowing down of the energetic atoms consist largely of compounds which could only be produced from highly fragmented ethyl bromide molecules. By contrast, the product from the ensuing diffusion-dependent reactions consists only of ethyl bromide. (auth)

6245

THE SZILARD-CHALMERS REACTION IN ETHYLENE DIBROMIDE. Miriam Milman, P. F. D. Shaw, and I. B. Simpson (Clarendon Lab., Oxford). J. Chem. Soc. 1310-17 (1957) Mar.

The retentions of radio-bromine produced by neutron capture in purified ethylene dibromide are not reproducible. This can be largely explained by the presence of vinyl bromide which is formed, on storage and by radiolysis, by dissociation of the parent compound. When present, vinyl bromide causes increased retentions by exchanging with radio-bromine atoms produced by neutron capture; subsequent addition of bromine or hydrogen bromide gives increased yields of active tribromoethane or ethylene dibromide respectively. Analysis of the products from the neutron irradiation of bromine-ethylene dibromide mixtures, shows that the predominant diffusion-controlled reactions result in the formation of ethylene dibromide and vinyl bromide, which is subsequently saturated to give tribromoethane. (auth)

6246

THE NATURE OF THE DIFFUSION-CONTROLLED REACTIONS FOLLOWING NEUTRON CAPTURE IN ALKYL BROMIDES. Miriam Milman and P. F. D. Shaw (Clarendon Lab., Oxford). J. Chem. Soc. 1317-25(1957) Mar.

The variation of retention caused by adding 1 : 2-dibromoethylene to ethyl bromide, ethylene and ethylidene dibromide, and 1 : 1 : 2-tri- and 1 : 1 : 2 : 2-tetra-bromoethane has been investigated in an attempt to elucidate the nature of diffusion-controlled reactions undergone by radicals resulting from neutron capture in these bromides. It is concluded that a large proportion of the radio-bromine

atoms, which diffuse from the site of neutron capture, is probably produced by reaction of organic radicals with HBr^* and Br_2^* formed by high-energy processes. (auth)

6247
THE NON-HOMOGENEOUS REACTIONS FOLLOWING NEUTRON CAPTURE IN ORGANIC BROMIDES. Miriam Milman and P. F. D. Shaw (Clarendon Lab., Oxford). J. Chem. Soc. 1325-32(1957) Mar.

An attempt is made to treat quantitatively the kinetics of the reactions occurring between radicals and inorganic radio-bromine compounds formed near the site of neutron capture. Allowance for the dilution of the reactants by diffusion has been made by considering these to be held uniformly in a sphere of liquid whose radius increases with time. By making reasonable assumptions regarding the rates of the reactions involved, curves have been obtained which fit the experimentally determined variation of retention with bromine concentration in ethyl bromide, ethylene dibromide, and tri- and tetra-bromoethane. (auth)

6248
TRANSPORT NUMBERS AND STRUCTURES IN FUSED $AgNO_3$-$NaNO_3$ MIXTURES. Frederick R. Duke, R. W. Laity, and Boone Owens (Iowa State Coll., Ames). J. Electrochem. Soc. 104, 299-300(1957) May.

The transport numbers of the ions in $NaNO_3$-$AgNO_3$ mixtures are very closely proportional to the mole fractions. The transport number of the nitrate ion remains essentially constant. It is thus concluded that there are no complex species in $NaNO_3$ or $AgNO_3$ and that all cations present are structurally in identical positions. This argues strongly against any concept except complete dissociation in this nitrate system. (auth)

ANALYTICAL PROCEDURES

6249 AERE-C/M-66(Del.)
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
THE DETERMINATION OF SMALL CONCENTRATIONS OF NITRITE IN AQUEOUS AND BUTEX SYSTEMS. A. L. Mills, K. Saddington, and K. D. B. Johnson. Apr. 25, 1950. Decl. with deletions Dec. 18, 1956. 3p.

A number of methods for the determination of small amounts of nitrite in aqueous and solvent media, in the absence or presence of uranyl nitrate have been examined and are discussed. Only the Griess-Ilosvay method has proved satisfactory for the purpose. Various modifications of the method must be made when uranyl nitrate is present in the systems and these modifications are described. (auth)

6250 AERE-C/M-155
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
A GENERAL METHOD FOR THE RAPID DETERMINATION OF TOTAL STRONG ACID ANION IN SOLUTION. M. J. Cabell. July 29, 1952. 8p.

The solution to be estimated is shaken for five minutes with an excess of Zeokarb 225 in the hydrogen form, the resin is filtered off, and the filtrate is titrated with standard alkali. In this way the total strong acid anion concentration of solutions of tetravalent ions can be estimated to ± 0.1 and of divalent ions to ± 0.5%. Under certain conditions the anion content of uni-univalent solutions can be determined to ± 1%. The method is simple and rapid and possesses considerable advantages over conventional methods for estimations with active solutions, e.g. the nitrate content of Pu solutions. (auth)

6251 AERE-C/R-1563
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
SQUARE WAVE POLAROGRAPHY. PART III: SINGLE DROP POLAROGRAPHY. G. C. Barker. Nov. 27, 1954. 19p.

A method is described for the detection and determination, at concentrations below 10^{-7}M, of ions of some of the metals which are soluble in Hg. A single Hg drop is used as an electrode and before recording a polarogram the ions in question are concentrated in the drop. (auth)

6252 AERE-C/R-2114
United Kingdom Atomic Energy Authority. Research Group. Chemistry Div., Woolwich Outstation, England.
THE FLAME PHOTOMETRIC DETERMINATION OF CAESIUM IN BISMUTH AND BISMUTH–URANIUM ALLOY. P. C. Wildy. Dec. 19, 1956. 13p. (LMFT/P-11).

A method for the determination of Cs in Bi and Bi–U alloy using an image converter flame photometer is described. The precision over the range 1 to 5% Cs is better than 5% and over the range 0.20 to 1% Cs is approximately 10%. The limit of sensitivity is 0.02%. (auth)

6253 CCC-1024-TR-229
Richmond, Va. Univ.
1,1′-DIANTHRIMIDE METHOD FOR SPECTROPHOTOMETRIC DETERMINATION OF BORON. W. A. Powell and E. H. Poindexter. Mar. 8, 1957. 28p. [For Callery Chemical Co. Contract NOa(s)-52-1024-c].

The 1,1′-dianthrimide method was confirmed as one of the best available for the colorimetric determination of up to 30 micrograms of B. This method is three times as sensitive as the carminic acid method, reproducible, and simple. Determinations require little time or skill. The effects of variables on the method were thoroughly studied, and the procedure was improved. Changes in sulfuric acid concentration do not greatly affect the accuracy of the results. The reagent does not require frequent standardization if stored in the dark. Highly-charged ions, strong oxidizing agents, and ions that form complexes with B are the only ions that interfere. (auth)

6254 HW-48770
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
SPECTROCHEMICAL ANALYSIS OF WATER. Roy Ko. Jan. 10, 1957. 11p. Contract W-31-109-Eng-52. $0.15 (OTS).

An evaporation-spectrographic method has been applied to the determination of traces of Fe, Ni, Cr, Zr, Ca, Mg, Cu, Al, Zn, Pb, Co, and Mn in high-purity water. The sample is concentrated by evaporation with In as the internal standard. The residue is analyzed by a graphite spark technique using flat top electrodes with a precision of ± 10% (Standard deviation of a single measurement). (auth)

6255 IGO-AM/W-82
Gt. Brit. Windscale Works, Sellafield, Cumb., England.
THE SAMPLING OF LIQUID CARBON DIOXIDE PRIOR TO ANALYSIS. Mar. 11, 1957. 5p.

A small heated sample cylinder for sampling liquid CO_2 prior to analysis is presented. The liquid CO_2 is conducted into one end and drawn off the other. (W.L.H.)

6256 KAPL-M-JLM-2
Knolls Atomic Power Lab., Schenectady, N. Y.
DETERMINATION OF TIN IN ZIRCALOY AND URANIUM-ZIRCALOY: COLORIMETRIC PROCEDURE. J. L. Marley and O. J. Articolo. Feb. 14, 1957. 6p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

Tin is separated from Zr on a Dowex-2-X ion exchange column in HCl. The Sn is eluted with diluted H_2SO_4 and determined spectrophotometrically with dithiol. Diethylammoniumdithiocarbamate is used to extract Sn from Zr-U mixtures prior to the dithiol determination. (auth)

6257 NAA-SR-1848

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

DETERMINATION OF URANIUM DIOXIDE IN STAINLESS STEELS BY THE X-RAY FLUORESCENCE METHOD. Louis Silverman, William W. Houk, and Lavada A. Moudy. Apr. 15, 1957. 11p. Contract AT(11-1)-GEN-8. $0.15 (OTS).

A rapid method for the determination of UO_2 in stainless steel by direct x-ray fluorescent analysis after chemical solution of the sample in perchloric acid is described. Strontium is used as an internal standard. X-ray fluorescence methods of analysis have many advantages over the commonly used chemical methods such as the colorimetric, gravimetric and volumetric, because elements which ordinarily interfere need not be separated before analysis. Statistically, eleven independent solutions were counted and nine sets of results were obtained on each one. Standard deviations are shown. (auth)

6258 NBL-134

New Brunswick Lab., AEC, N. J.

SEMIANNUAL PROGRESS REPORT FOR THE PERIOD JULY 1956 THROUGH DECEMBER 1956. C. J. Rodden. Apr. 1957. 20p. $0.20(OTS).

Improvements are reported in neutron activation determination of U^{235} and isotopic analysis of U. A turbidimetric method for sulfate in UO_3 is described. Determination of B isotopes by mass spectrometer is discussed. The stringer count method for rating U metal quality is tested and methods for measuring UO_3 reactivity are evaluated. (For preceding period see NBL-133.) (T.R.H.)

6259 NP-6252

Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.

DETERMINATION OF OXYGEN IN TITANIUM. William R. Hansen and Manley W. Mallett. Feb. 25, 1957. 21p.

The methods currently in use for the quantitative determination of O_2 in Ti and Ti alloys are briefly described. (W.L.H.)

6260

SPECTROPHOTOMETRIC DETERMINATION OF URANIUM WITH THIOCYANATE IN BUTYL CELLOSOLVE–METHYL ISOBUTYL KETONE–WATER MEDIUM. Oscar A. Nietzel and Michael A. De Sesa (National Lead Co., Winchester, Mass.). Anal. Chem. 29, 756-9(1957) May.

A spectrophotometric method for the determination of U in ores and leach liquors consists of separation of U from interfering ions by extraction into methyl isobutyl ketone, using $Al(NO_3)_3$ as a salting agent, followed by development of the color in a portion of the extract with a solution of NH_4CNS in a butyl Cellosolve–water solvent. The yellow uranyl thiocyanate complex forms immediately, and the color is stable for at least 48 hours. The optimum range of U concentration at 375 mμ is from 0.4 to 2.0 mg. of U_3O_8 in the sample aliquot. The coefficient of variation of absorbance measurements on standard solutions at 375 mμ was 0.34%. Titanium is the only serious interference, but procedures are given which make it possible to analyze samples containing as much as 5 mg of Ti in the sample aliquot. (auth)

6261

COMPLEXOMETRIC TITRATIONS USING AZOXINE INDICATORS. James S. Fritz, William J. Lane, and Ann Sutton Bystroff (Iowa State Coll., Ames). Anal. Chem. 29, 821-5 (1957) May.

6262

APPLICATIONS OF ANION EXCHANGE RESINS TO DETERMINATION OF BORON. John D. Wolszon and John R. Hayes (Pennsylvania State Univ., University Park) and William H. Hill (Univ. of Pittsburgh). Anal. Chem. 29, 829-32(1957) May.

The behavior of boric acid and of several known interferences has been investigated using both weak and strong base anion exchange resins. A simple, rapid chromatographic technique employs Cl^- as an elution indicator, applicable to the concentration and separation of B from dilute solutions of low total salt content. Boron is separated from most of the known titrimetric interferences by a mixed bed ion exchange column. The procedure is rapid, requires no special treatment of the sample prior to the exchange process, and compares favorably with existing techniques. However, it cannot be recommended for separation of B prior to colorimetric determination. (auth)

6263

SELECTIVE PRECIPITATION OF THORIUM IODATE FROM A TARTARIC ACID–HYDROGEN PEROXIDE MEDIUM. APPLICATION TO RAPID SPECTROPHOTOMETRIC DETERMINATION OF THORIUM IN SILICATE ROCKS AND IN ORES. F. S. Grimaldi, Lillie B. Jenkins, and Mary H. Fletcher (U. S. Geological Survey, Washington). Anal. Chem. 29, 848-51(1957) May.

A selective iodate separation of Th from HNO_3 medium containing d-tartaric acid and H_2O_2 is presented. The catalytic decomposition of H_2O_2 is prevented by the use of 8-quinolinol. A few μg of Th are separated sufficiently clean from 30 mg of such oxides as Ce Zr, Ti, Nb, Ta, Sc, or Fe with one iodate precipitation to allow an accurate determination of Th with the thoron-mesotartaric acid spectrophotometric method. The method is successful for the determination of 0.001% or more of ThO_2 in silicate rocks and for 0.01% or more in black sand, monazite, thorite, thorianite, eschynite, euxenite, and zircon. (auth)

6264

PHOTOELECTRIC FABRY-PEROT INTERFEROMETER FOR ASSAY OF LEAD AND URANIUM ISOTOPES. J. K. Brody, F. S. Tomkins, and M. Fred (Argonne National Lab., Lemont, Ill.). Spectrochim. Acta 8, 329-47(1957) Feb.

The Fabry-Perot interferometer was used with photoelectric detection for precise intensity measurements of the complex pattern of Pb-4057·82 A. The central fringe was scanned by a change of pressure in the interferometer housing. Optical and electronic arrangements for employing the internal-standard principle with the interferometer are described. The concentration of Pb^{208}, Pb^{206}, Pb^{204}, and Pb^{207} determined by the method are essentially in agreement with mass spectroscopic results. Small isotope shifts in the U spectrum were examined because of similarities with other heavy-element spectra, particularly Pu for which it was hoped a method might be developed. Partially resolved U^{235} hyperfine structure necessitated a search for U^{235} lines with negligible structure. Low intensity of the hollow cathode source limited the usefulness of the interferometer method for U. (auth)

6265

SAMPLE TRANSPORT AND TEMPERATURE STUDIES IN POROUS-CUP DISCHARGES. Cyrus Feldman and Margaret K. Wittels (Oak Ridge National Lab., Tenn.). Spectrochim. Acta 9, 19-39(1957) Mar.

High-speed color motion pictures were taken of porous-cup discharges produced by a triggered polarized low-voltage condensed spark. These pictures indicated that

soon after the trigger spark strikes the surface of the porous-cup electrode (PCE) a conical jet of solution vapor is emitted from another location on this surface. The discharge channel soon shifts to the axis of this vapor jet. The outer portions of the jet contain luminous fragments of water and solute molecules, but do not carry current. The interpretation of spectroscopic temperature measurements is discussed. A procedure is described for measuring the mean rotational temperature of the OH molecules in a transverse zone of the discharge; it is believed that these temperature values correctly reflect the excitation conditions to which vaporized solute atoms and ions are subjected. Near the PCE, where the discharge channel occupies almost all of the vapor jet, the temperature appears to be governed by a Saha equilibrium. Near the counter-electrode, where the discharge channel occupies only a small fraction of the luminous cone, temperature appears almost independent of solution composition. Most emission of metallic lines occurs in the latter zone. (auth)

6266

A METHOD FOR THE SPECTRAL QUANTITATIVE ANALYSIS OF THE ISOTOPIC COMPOSITION OF HEAVY WATER. Yu. P. Dontsov and A. R. Striganov. Zhur. Analit. Khim. 12, 6-9(1957) Jan.-Feb. (In Russian)

A spectral method and apparatus for quantitative analysis of small amounts of heavy water are described. The calibration graph has been drawn up for the interval of concentration 2 to 80% D_2O in H_2O. The relative error changes in dependence to the concentration from ± 4% to ± 0.6%. (tr-auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

6267

NEUTRON DIFFRACTION STUDY OF MANGANESE FERRITE. Julius M. Hastings and Lester M. Corliss (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. 104, 328-31 (1956) Oct. 15.

Neutron diffraction patterns have been obtained for polycrystalline $MnFe_2O_4$ at 300°K and 4.2°K. The fraction of tetrahedral sites occupied by Mn^{+2} has been found to be 0.81 ± 0.03, indicating that $MnFe_2O_4$ has very nearly the normal spinel structure. The value 0.3846 ± 0.0003 has been assigned to the space group parameter u. The observed magnetic scattering is consistent with the Néel model and with the measured saturation moment. (auth)

DEUTERIUM AND DEUTERIUM COMPOUNDS

6268 AEC-tr-2887

OPTIMUM CONDITIONS FOR THE ENRICHMENT OF HEAVY WATER IN HOT-COLD COLUMNS. PART I. THE SINGLE HOT-COLD SYSTEM. K. Bier. Translated Chem. Ing. Tech. 28, 625-88(1956). 26p.

6269

MEASUREMENT OF LOW DEUTERIUM CONCENTRATION IN WATER BY MEANS OF FLOAT METHOD. B. Brigoli, E. Cerrai, and M. Silverstri (CISE Labs., Milano). Energia nucleare (Milan) 4, 43-9(1957) Feb.

An improved version of the float method for the measurement of the deuterium concentration in water is described. A description of the apparatus and a calibration on samples of known isotopic concentration are included. (C.H.)

FLUORINE AND FLUORINE COMPOUNDS

6270

THE KINETICS OF THE REACTION OF FLUORINE WITH IODINE PENTAFLUORIDE TO FORM IODINE HEPTAFLUORIDE. Jack Fischer and Robert K. Steunenberg (Argonne National Lab., Lemont, Ill.). J. Am. Chem. Soc. 79, 1876-8(1957) Apr. 20.

The kinetics of the vapor phase reaction of fluorine with iodine pentafluoride to form iodine heptafluoride has been studied from 55.6 to 95°. The rate of the reaction was found to be second order with respect to the reactant pressures. The rate constants showed an Arrhenius temperature dependence, with an activation energy of 14 kcal. per mole. The reaction was homogeneous, suggesting that the rate-determining step is a bimolecular collision. (auth)

Refer also to abstract 6222.

GRAPHITE

6271 AERE-N/PC-2

[Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

THE EFFECT OF IRRADIATION ON THE RESISTIVITY OF GRAPHITE. ANNEALING OF IRRADIATED GRAPHITE.] T. M. Fry. July 4, 1949. Decl. Feb. 5, 1957. 6p.

6272

ELECTRICAL RESISTIVITY OF GRAPHITE IRRADIATED WITH NEUTRONS. R. W. Attree and O. Dahlinger (Atomic Energy of Canada Ltd., Chalk River, Ontario). Can. J. Phys. 35, 462-9(1957) Apr.

Measurements have been made of the changes in the electrical resistance of an artificial graphite which are induced by neutron irradiation and subsequent annealing. The resistivity increases with irradiation; the increase in resistance is partially removed by annealing at 128°C. These changes have been interpreted using Wallace's theory of the electron structure of graphite. The number of atoms displaced by the irradiation has been calculated using the method of Seitz, and is shown to be consistent with the experimental results. (auth)

LABORATORIES AND EQUIPMENT

6273 BNL-2811

Brookhaven National Lab., Upton, N. Y.

INEXPENSIVE EQUIPMENT FOR STUDYING THE IRRADIATION OF ORGANIC MATERIALS IN A PILE UNDER STATIC CONDITIONS. Alfred P. Wolf and A. Oltmann. [1956]. 9p. $1.80(ph OTS); $1.80(mf OTS).

A convenient and inexpensive device for irradiating materials under pressure or irradiating materials which evolve gas upon irradiation is described. It consists of an Al alloy container and an arrangement which permits opening the vessel in a closed system. (T.R.H.)

6274

GLOVE BOX DESIGN AND OPERATION. J. A. Lee (AERE, Harwell). Nuclear Power 2, 139-41(1957) Apr.

The problems of handling radioactive and toxic materials are discussed as to the safety aspects, design, maintenance, and health physics of glove boxes. (W.L.H.)

6275

PLANNING THE RADIOACTIVITY LABORATORY. John M. Ruddy (Brookhaven National Lab., Upton, N. Y.). Plant Eng. 10, No. 8, 83-6, 174-5(1956) Aug.

RADIATION CHEMISTRY

6276 OSR-TN-56-494

Johns Hopkins Univ., Baltimore.

NUCLEAR MAGNETIC RESONANCE STUDY OF THE

B_2D_6-B_5H_9 EXCHANGE REACTION. Technical Note No. 4. Walter S. Koski, Joyce J. Kaufman, and Paul C. Lauterbur. Oct. 1956. 12p. Contract AF18(600)-1526. (AD-110308).

The exchange of deuterium between diborane and pentaborane was investigated by nuclear magnetic resonance. It was found that the exchange proceeded preferentially in the terminal hydrogen positions in pentaborane. The rate of exchange of the apex hydrogen was to within ± 10% the same as the exchange rate of the base terminal hydrogen. Under the experimental conditions the bridge hydrogens in pentaborane did not participate in the exchange. (auth)

6277

RADIOMETRIC STUDIES OF TWO- AND THREE-VALENT IONS WITHIN THE CONCENTRATION RANGE OF 10^{-1} TO 10^{-9} N. S. Yu. Elovich and V. N. Prusakov (Inst. of Physical Chemistry, Acad. of Sciences, U.S.S.R.). Doklady Akad. Nauk S.S.S.R. 112, 684-7(1957) Feb. 1. (In Russian)

Radioelements Ce^{144} and Sr^{89} without carriers were selected for studies of the transition phenomena in chromotographic processes of two and three-valent ions in the 10^{-1} to 10^{-9} N concentration range. Records of ions moving in the column were taken radiometrically using the scheme of coincidences, and the table of experimental and theoretical data for the Ce^{3+} and Sr^{2+} motion in adsorption processes are presented. (R.V.J.)

6278

THE POLYMERIZATION OF ACRYLAMIDE IN AQUEOUS SOLUTION. PART 1. THE X- AND γ-RAY INITIATED REACTION. E. Collinson, F. S. Dainton, and G. S. McNaughton (The Univ., Leeds). Trans. Faraday Soc. 53, 476-88(1957) Apr.

The kinetics of the polymerization of aqueous solutions of acrylamide initiated by 50 Kvp x rays, 220 Kvp x rays and Co^{60} γ rays have been investigated. Dose rates ranged from 2.3×10^{14} to 4.6×10^{18} ev l^{-1} sec^{-1}. For concentrations of acrylamide between 0.1M and 2.0M the following relations were established: $R_p \propto [m_1]^{1.0} I_{abs.}^{\frac{1}{2}}$, $\overline{DP} \propto [m_1]^{1.17 \pm .09} I_{abs.}^{-0.21 \pm .05}$, where R_p is the over-all rate of polymerization. $\overline{DP}$ is the average degree of polymerization, $[m_1]$ is the initial monomer concentration, and $I_{abs.}$ is the dose rate. The expression for the rate is satisfied by a mechanism in which termination is by mutual interaction of growing chains, and in which the distribution of initiating radicals is effectively uniform. This mechanism also satisfies the monomer dependence of the degree of polymerization, but the dose rate dependence remains unexplained. Viscosity molecular weight measurements indicate that transfer occurs only to a small extent, if at all. The over-all activation energy, based on measurements at two temperatures only, is $E_a = 1.5 \pm 1.5$ kcal/mole. The ratio $k_p/k_t^{\frac{1}{2}}$ has been evaluated as 4.7 ± 0.7 $l^{\frac{1}{2}}$ $mole^{-\frac{1}{2}}$ $sec^{-\frac{1}{2}}$ at 25°C. (auth)

6279

THE POLYMERIZATION OF ACRYLAMIDE IN AQUEOUS SOLUTION. PART 2. THE EFFECT OF FERRIC PERCHLORATE ON THE X- AND γ-RAY INITIATED REACTION. E. Collinson, F. S. Dainton, and G. S. McNaughton (The Univ., Leeds). Trans. Faraday Soc. 53, 489-98(1957) Apr.

Acidified $Fe(ClO_4)_3$ causes linear termination of the x- or γ-ray initiated polymerization of acrylamide in water. The $Fe^{3+}OH^-$ ion appears to terminate polymer chains more efficiently than does the Fe_{aq}^{3+} ion, the respective termination rate constants being $k_5 = 1.1 \pm 0.6 \times 10^4$ l $mole^{-1}sec^{-1}$ and $k_4 = 2.0 \pm 0.6 \times 10^3$ l $mole^{-1}$ sec^{-1}. Measurement of the yield of Fe^{2+} led to an evaluation of the yield of initiating radicals from 50 Kvp x rays as ($G_{OH} + G_H$) ≯ 6.9. Under conditions of exclusively linear termination by Fe^{3+}, the number average degree of polymerization is equal to the rate of polymerization divided by the rate of Fe^{2+} formation. Using the observed values of this ratio and of the viscosity of the solutions, the intrinsic viscosity against molecular weight relation for unfractionated polyacrylamide is found to be $[\eta] = 6.8 \times 10^{-4} \overline{M}_N^{0.66 \pm 0.05}$. (auth)

RADIATION EFFECTS

6280 AERE-GP/R-1402

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

THE EFFECT OF HIGH DOSES OF IONIZING RADIATIONS ON ORGANIC HIGH POLYMERS. K. Little. Mar. 22, 1954. 9p.

The effect of ionizing radiation on the preparation and degradation of organic high polymers is discussed. (W.L.H.)

6281 AERE-M/TN-28

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

RADIATION COLORATION IN GLASSES. M. Levy. Dec. 3, 1954. 8p.

Studies on the coloration of glass by radiations are reviewed. Possible mechanisms of coloration and inhibition are discussed and an attempt is made to correlate experimental observations. 35 references. (C.H.)

6282 NP-6256

Shell Development Co., Emeryville, Calif.

RESEARCH ON THE DETERMINATION OF THE STABILITY OF JET ENGINE FUELS. Quarterly Progress Report No. 1 [for] September 1 through November 30, 1956. Harry B. Minor, Alan C. Nixon, and Roy E. Thorpe. 65p. Contract AF33(616)-3888. (S-13711).

A study of the effects of environment and composition on the thermal and radiation stability of jet fuels is continuing. The possibility that the radiation resistance of the fuel can be enhanced by addition of aromatic compounds as "protectors" is being investigated. (W.L.H.)

6283 AEC-tr-2886

THE ACTION OF RADIOACTIVE COBALT (Co^{60}) γ-RADIATION ON PROTEINS AND AMINO ACIDS. M. A. Khenokh and E. M. Lapinskaya. Translated from Doklady Akad. Nauk S.S.S.R. 110, 125-8(1956). 10p.

6284

CHEMICAL ACTION OF IONISING RADIATIONS IN SOLUTION. PART XX. ACTION OF X-RAYS (200 kv) ON ETHANOL IN AQUEOUS SOLUTION. G. G. Jayson, G. Scholes, and J. Weiss (Univ. of Durham, Newcastle upon Tyne). J. Chem. Soc. 1358-68(1957) Mar.

The action of x rays (200 kv) on ethanol in aqueous solution in the presence of oxygen gave only acetaldehyde; in deaerated solutions, butane-2:3-diol was also produced. Quantitative studies have been carried out under various experimental conditions and the effects of pH and concentration of the solute have been examined. A mechanism for the radiation chemistry of aqueous-ethanol solutions in the presence and in the absence of oxygen has been proposed. The detailed study of this system has led to some new aspects regarding the modes of formation of hydrogen peroxide from OH radicals in aqueous systems. In deaerated ethanol solutions, a feature of interest is the importance of the dehydrogenation of ethanol by hydrogen atoms: $CH_3 \cdot CH_2 \cdot OH + H \rightarrow CH_3 \cdot CH(OH) + H_2$. (auth)

6285

PROTECTION OF SULFHYDRYL GROUPS AGAINST IONIZING RADIATION. F. E. Littman, E. M. Carr, and J. K. Clauss (Stanford Research Inst., Menlo Park, Calif.). Science 125, 737-8(1957) Apr. 19.

Results indicate that the sulfhydryl groups may be protected against ionizing radiation by masking the radiosensitive groups by specific chemical reactions and by the addition of free radical acceptors. (W.L.H.)

RARE EARTHS AND RARE-EARTH COMPOUNDS

6286

CONTROLLING RARE-EARTH SEPARATIONS BY MEANS OF VARYING RESIN COLUMN OPERATING TEMPERATURES. D. C. Stewart (Argonne National Lab., Lemont, Ill.). J. Inorg. and Nuclear Chem. 4, 131-3(1957) Mar.

6287

THE REACTION OF CERIUM(III) WITH 2-METHYL-8-QUINOLINOL. Wesley W. Wendlandt (Texas Tech. Coll., Lubbock). J. Inorg. and Nuclear Chem. 4, 133-4(1957) Mar.

Cerium(III) reacted with 2-methyl-8-quinolinol to form a purple colored chelate that precipitated out of solution. The general formula for this precipitate is $Ce(C_{10}H_8NO)_4$. (W.L.H.)

6288

SPECTRAL ANALYSIS BY EVAPORATION METHOD. (COMMUNICATION II. DETERMINATION OF IMPURITIES IN THORIUM AND BERYLLIUM COMPOUNDS BY THE METHOD OF EVAPORATION IN THE VACUUM.) A. N. Zaĭdel et al. (Leningrad State Univ.). Zhur. Analit. Khim. 12, 17-22(1957) Jan.-Feb.

The evaporization method has been used for determination of the impurities in compounds with many and few spectral lines. The method is effective for solving various spectral-analytical problems in determination of volatile impurities in different refractory and non-volatile compounds and in the analysis of Zr_2O and other rare earth oxides. Experiments with highly pure samples produced the most effective results. (tr-auth)

6289

A NEW METHOD FOR ANALYTICAL DETERMINATION OF PROTACTINIUM. I. E. Starik et al. (Leningrad Radium Inst.). Zhur. Analit. Khim. 12, 87-91(1957) Jan.-Feb. (In Russian)

A method for the analytical determination of Pa based on its coprecipitation with mandelic acid from hydrochloric acid solutions permitting a rapid and complete separation of Pa from all natural α-active radioelements has been offered. (tr.-auth)

6290

ON THE PREPARATION AND SOME PROPERTIES OF THORIUM SULFIDES. G. V. Samsonov and N. M. Popova. (Moscow Inst. of Non-Ferrous Metals and Gold.). Zhur. Obshchei Khĭm. 27, 3-10(1957) Jan. (In Russian)

The precise conditions for thorium sulfide preparations by direct Th reactions with S have been determined and ThS and Th_2S_3 have been found to be the more stable sulfide phases of the Th–S system. Observations revealed that during ThS formation O_2 can enter the lattice with S thus causing an increase in the period. It was also noticed that Th_2S_3 is a phase of alternating composition, however it remains homogeneous in the interval $ThS_{1.22}$ to $ThS_{1.59}$. The melting point and the microhardness of ThS and Th_2S_3 have been determined and the properties of thorium sulfides compared with the properties of other analogous transitory metals with metalloids. (R.V.J.)

SEPARATION PROCEDURES

6291 AERE-CE/R-968

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

TRI-n-BUTYL PHOSPHATE STUDIES. PARTS I, II, III. J. Kennedy and S. S. Grimley. Oct. 6, 1952. Decl. Nov. 30, 1956. 30p.

The chief impurities in commercial TBP have been identified and estimated. The isolation of mono- and di-n-butyl phosphates for characterization and estimation purposes is described. A method is given for their identification based on the melting points of their s-benzyl thiouronium salts and is applied to the commercial TBP medium. Other impurities are dealt with quantitatively and a rapid method for the prufication of the commercial solvent for extraction purposes is presented. (auth)

6292 CF-56-3-171

Oak Ridge National Lab., Tenn.

DESIGN AND PERFORMANCE OF A DUAL-CLONE LIQUID SEPARATOR. James C. Bresee. Mar. 26, 1956. 9p. Contract [W-7405-eng-26]. $0.15(OTS).

A separator based upon hydroclones with a very high separation efficiency has been developed. The separator, called a "dual-clone," uses two hydroclones connected and operated in such a manner that the first clone produces essentially pure solvent and the second, pure water. Phase purities in excess of 99.9% have been obtained with throughputs of approximately one liter per minute with a total separator pressure drop of 20 psi. (auth)

6293 HW-48735

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

LIGHT WATER SEPARATION WITH TRIETHYLAMINE. H. T. Hahn and E. B. Street. Feb. 22, 1957. 8p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

A proposed liquid-liquid extraction process using triethylamine for the separation of light water from heavy water is described. Results of experiments showed that no separation was observed in the system triethylamine–water in region of 2 to 3% light water. (W.L.H.)

6294 NAA-SR-1734

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

SOLID AND LIQUID DROSSING OF THORIUM CONTAINING TRACER LEVEL FISSION PRODUCTS. N. D. Potter. Apr. 15, 1957. 16p. Contract AT-11-1-GEN-8. $0.20 (OTS).

A study has been made of the distribution of the principal fission products, Pa, and U between tracer level Th-(3 wt. %)U and certain oxides, carbides, sulfides and nitrides. The highly volatile elements Cs and Sr are removed from the metal to the extent of 70 to 100%; 30 to 90% of the less volatile elements Ce and other rare earths are removed from the metal. Most of the Zr, Ru, Pa, and U remain in the alloy. (auth)

6295 NAA-SR-1735

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

FISSION PRODUCT SEPARATION FROM THORIUM–URANIUM ALLOY BY ARC-ZONE MELTING. R. D. Burch and C. T. Young. Apr. 15, 1957. 23p. Contract AT-11-1-GEN-8. $0.25(OTS).

An experimental investigation was made to determine the feasibility of removing fission products from irradiated Th–U alloys by using a zone-melting process. This process utilizes an electric arc to maintain the molten zone. Radiochemical analyses of the processed alloys

indicated that U, Te, Zr, and Ru were successfully moved in the direction of zone travel, and that some of the fission products were removed during processing by volatilization. (auth)

6296 WIN-60

National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.

ACID LEACH–RESIN-IN-PULP PILOT PLANT TESTING OF RIO de ORO DYSART SHAFT ORE. A. W. Griffith, M. A. Peters, W. D. Charles, and R. L. Shimmin. Jan. 7, 1957. 49p. Contract AT(49-6)-924. $7.80(ph OTS); $3.30 (mf OTS).

Rio de Oro Dysart Shaft Ore from the Ambrosia Lake District, N. Mex., was treated in the Acid Leach–Resin-In-Pulp Pilot Plant at Grand Junction, Colorado. Information on grinding, leaching, sand-slime separation, ion exchange, solvent extraction of H_2SO_4 pregnant eluates, and precipitation is reported. Results show the ore to be amenable to the Resin-In-Pulp process. (auth)

6297 AEC-tr-2894

PAPER CHROMATOGRAPHIC SEPARATION AND IDENTIFICATION OF MONOHYDRIC ALCOHOLS. III. COMMUNICATION ON THE PAPER CHROMATOGRAPHY OR ORGANIC ACIDS. A. Siegel and K. Schlögl. Translated by R. Todd from Mikrochemie ver. Mikrochim. Acta 40, 383-9(1953). 9p.

Methods are presented for the separation and identification of methanol, ethanol, n-propanol, and n-hexanol by paper chromatographic means. The separation entails making phthalate and phenate derivatives. (W.L.H.)

6298 AERE-Lib/Trans-694

SEPARATION OF MIXTURES BY LOW-PRESSURE RECTIFICATION. N. M. Zhavoronkov, V. A. Malyusov, and N. N. Umnik. Translated by R. C. Murray from Akad. Nauk S.S.S.R., Otdel. Khim. Nauk, Metody i Protsessy Khim. Tekhnol., Sbornik, 1, 45-64(1955). 26p.

6299

ION EXCHANGE. FIVE CONTRIBUTIONS TO NUCLEAR TECHNOLOGY. 1. URANIUM EXTRACTION. 2. URANIUM PURIFICATION. 3. REACTOR WATER TREATMENT. 4. ZIRCONIUM PURIFICATION. 5. WASTE DISPOSAL. L. D. Roland (Permutit Co., Ltd.). Atomics 8, 131-5(1957) Apr.

6300

RESIN-IN-PULP ION EXCHANGE WINS U_3O_8. Chem. Eng. 64, No. 5, 228-31(1957) Apr.

The resin-in-pulp process for recovery of U from ores is described. The process utilizes resin-filled baskets oscillating in the slime pulp, thus eliminating slime removal stages. The baskets operate in 14 series-hooked tanks, 4 of which are for elution. Sulfuric acid leached, MnO_2 oxidized pulp is adjusted to a pH of 1.7 and treated with $FeSO_4$ to reduce V to VO_4^{3-}. After adsorption the U is precipitated from eluted liquor as magnesium ammonium diuranate. (T.R.H.)

6301

ON THE SEPARATION OF BORON ISOTOPES BY CHEMICAL EXCHANGE. G. M. Panchenkov, V. D. Molseev, and A. V. Makarov (Lomonosov Moscow State Univ.). Doklady Akad. Nauk S.S.S.R. 112, 659-61(1957) Feb. 1. (In Russian)

Descriptions are given of B isotope separation by chemical exchange based on the reaction of $B^{10}F_3 + A{\cdot}B^{11}F_3 \rightleftharpoons B^{11}F_3 + A{\cdot}B^{10}F_3$; where A is the anisole $C_6H_5OCH_3$ and $A{\cdot}BF_3$ is the liquid complex compound of anisole with boron fluoride. It has been shown that the isotope exchange reaction, as shown above, really exists with the equilibrium constant $\alpha = 1.013 \pm 0.005$ and the isotope B^{10} concentrated in the anisole-fluorine boron complex, i.e. in the liquid phase. Results of the experiments are shown in tabular and graphical forms. (R.V.J.)

6302

THE SEPARATION OF THE LANTHANONS WITH THE AID OF ETHYLENEDIAMINE-TETRA-ACID ("ENTA ACID"). PART VI. ION-EXCHANGE STUDIES OF THE HEAVY AND MIDDLE LANTHANONS AND YTTRIUM. J. K. Marsh (Dyson Perrins Lab., Oxford). J. Chem. Soc. 978-82(1957) Mar.

Hot, shallow beds of fine sulphonated polystyrene cation exchanger are loaded with lanthanons and developed on a bed of mixed copper and hydrogen forms of the resin by elution with ammonium-buffered "enta acid." Good yields of purified heavy and middle lanthanons are obtained, but the separation of dysprosium from yttrium is exceptionally difficult. A crude load of 0.6 equivalent of lanthanon per cm^2 of column cross-section on a bed 60 cm deep was separated into ternary mixtures. These, re-run at 0.1–0.15 equiv/cm^2, were resolved satisfactorily on 45- or 60-cm beds (load vol/development vol. = 1) and recovered in solution of concentrations greater than 0.2 equiv/l. Intermediates between each pair of purified earths amounted to about 0.007 equiv/cm^2 or a 3 cm band on the developed column. (auth)

6303

TRI-n-BUTYL PHOSPHATE AS AN EXTRACTING SOLVENT FOR INORGANIC NITRATES—I. K. Alcock, F. C. Bedford, W. H. Hardwick, and H. A. C. McKay (Atomic Energy Research Establishment, Harwell, Didcot, Berks). J. Inorg. and Nuclear Chem. 4, 100-5(1957) Mar.

The extraction of tracer Zr by 19% v/v (0.69 M) tri-n-butyl phosphate (TBP) in kerosene has been studied from aqueous solutions consisting of (i) nitric acid, (ii) nitric acid plus an inextractable nitrate (sodium nitrate), and (iii) nitric acid plus an extractable nitrate (uranyl nitrate). The partition coefficients increase steeply with rising acidity, they are little affected by substitution of sodium nitrate for nitric acid, and they fall considerably on addition of uranyl nitrate to the system. (auth)

6304

CHEMICAL PROCESSING OF NUCLEAR FUELS. C. M. Nicholls and R. Spence. Nuclear Power 2, 152-4(1957) Apr.

Processing of spent fuels from power reactors is discussed. Since economy is important in processing it is proposed that moderate decontamination 10^2 instead of 10^8 is sufficient for power reactors since they will operate at high burnup and will not produce weapon material. A general chemical processing method is described. (W.L.H.)

6305

CARRIER-FREE SEPARATION OF Sn^{113} FROM INDIUM. K. S. Bhatki and P. Radhakrishna (Tata Inst. of Fundamental Research, Bombay). Proc. Indian Acad. Sci. 45, 30-4(1957) Jan.

A procedure for the separation of carrier-free Sn^{113} from deuteron bombarded In is described. The method employed depends on the extraction of stannic cupferrate from mineral acid solution using CCl_4, followed by ignition of the complex. (auth)

SPECTROSCOPY

6306

SPECTROPHOTOMETRIC STUDIES OF ELECTROLYTIC DISSOCIATION. PART 4. SOME URANYL SALTS IN WATER. E. W. Davies and C. B. Monk (Univ. of Coll. of Wales, Aberystwyth). Trans. Faraday Soc. 53, 442-9(1957) Apr.

The extent of ion-association between the UO_2^{2+} and the

Cl^-, Br^-, SCN^- and SO_4^{2-} ions has been estimated from absorption measurements at 25°C. These extend into regions of low ionic strength in order to minimize errors in the calculated activity coefficients. A simple way of eliminating errors due to stray light is illustrated by means of $UO_2(ClO_4)_2$. (auth)

6307

USE OF COMMERCIAL SHEET FILM FOR SPECTROCHEMICAL ANALYSIS. Morris Slavin (Brookhaven National Lab., Upton, N. Y.). Appl. Spectroscopy 10, No. 3, 155-7(1956).

Based on several years' experience, the substitution of commercial sheet film for glass plates is advocated for spectrochemical purposes. Advantages of sheet film are freedom from breakage, ease of cutting and filing, and ability to photograph wide spectral regions in one piece. Commercial emulsions are more uniformly coated and are much more free from blemishes. Holders for glass plates can be used for film with no structural changes. A list of available emulsions which can be used in place of spectroscopic plates is presented. (auth)

TRANSURANIC ELEMENTS AND COMPOUNDS

6308

THE DISTRIBUTION OF PLUTONIUM AND FISSION PRODUCTS BETWEEN MOLTEN URANIUM AND MOLTEN URANIUM TRIFLUORIDE – BARIUM HALIDE MIXTURES. F. S. Martin and E. W. Hooper (Atomic Energy Research Establishment, Harwell, Didcot, Berks). J. Inorg. and Nuclear Chem. 4, 93-9(1957) Mar.

The distribution of Pu between molten U and mixtures of UF_3 with $BaCl_2$ or fluoride has been measured at temperatures of 1200 to 1400°C. The equilibrium constant for the reaction $Pu + UF_3 = PuF_3 + U$ is found to be 72 ± 50%, calculated on a mole fraction basis. This corresponds to a standard free energy change for the reaction at 1200°C of approximately – 13 kcals, which agrees well with the estimated value. On the 20-g-of-U scale, at least 60-min contact between phases is required to establish equilibrium. Fission-product removals from the metal are greater than 99% under a variety of conditions, but owing to the complications of self-slagging effects, the results cannot be interpreted in terms of equilibrium constants. About 80% of fission-product Cs and about 20% Sr volatilizes under these conditions. The same final equilibrium is achieved if the salt mixtures are initially made up with UF_4 instead of the UF_3, reduction by the metallic phase being substantially complete. (auth)

URANIUM AND URANIUM COMPOUNDS

6309 AERE-C/R-1703

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

SOME ASPECTS OF THE SYSTEM UO_3–H_2O. J. K. Dawson, E. Wait, K. Alcock, and D. R. Chilton. Sept. 14, 1955. Decl. Jan. 21, 1957. 28p. (RCTC/P-52).

Uranium trioxide in contact with water at about 180°C gives an orthorhombic hydrate, UO_3. 0.8 H_2O, with the cell dimensions a = 10.23 ± 0.01 A, b = 6.89 ± 0.01 A, c = 4.28 ± 0.01 A. These dimensions appear to vary slightly with deviation of the H_2O content from 0.8 mole per U atom. Between 200 to 280°C another phase appears, UO_3. 1.0 H_2O, also orthorhombic with cell dimensions a = 5.638 ± 0.005 A, b = 6.273 ± 0.005 A, c = 9.925 ± 0.005 A, space group Pbca. The hemi-hydrate, UO_3. 0.5 H_2O, is stable in water above 280°C. A further phase, probably triclinic, was observed when the UO_3 was heated in water at 230°C in contact with glass, probably due to a relatively high pH. Some of the properties of these hydrates are described, together with observations on the preparation of pure anhydrous UO_3 from $UO_2(NO_3)_2$. Possible applications of aqueous slurries of UO_3 hydrate to homogeneous reactors are discussed. (auth)

6310 NMI-1168

Nuclear Metals, Inc., Cambridge, Mass.

USE OF A CHIP METHOD TO PRODUCE HOMOGENEOUS ALUMINUM–URANIUM ALLOY FOILS. W. L. Larson and J. L. Klein. Dec. 27, 1956. 65p. Contract AT(30-1)-1565. $0.40(OTS).

Inasmuch as it is extremely difficult to get a uniform distribution of U in Al–U alloys by conventional melting and casting techniques, the "Chip Method" has been devised and applied to the fabrication of homogeneous 85 wt. % Al 15 wt. % U alloy foils. A description of the experimental techniques and results is given. Alloy ingots were made by conventional vacuum melting and casting techniques. Each ingot was machined completely into chips, and, after being degreased, the chips were thoroughly mixed by tumbling. Chips were then cold-compacted, canned, evacuated, hot compacted, and hot extruded into a $\frac{1}{8}$-in. by $1\frac{1}{8}$-in. flat. The extruded flat was cold rolled to 0.015-in. ± 0.0003-in. thick foil and milled to the proper width. Chemical analyses of the extruded flats and rolled foils showed that homogeneous foils were obtained. (auth)

6311 KAPL-1743

Knolls Atomic Power Lab., Schenectady, N. Y.

THE PARTICLE SIZE OF SOME URANIUM DIOXIDE SAMPLES. F. D. Leipziger. Mar. 8, 1957. 18p. Contract W-31-109-Eng-52. $0.20(OTS).

Surface area measurements by the BET N_2 adsorption method were made on four different UO_2 samples. The particle size of the UO_2 was calculated from these measurements and compared with particle size measurements determined by studying x-ray line broadening and settling velocity, and measurements by electron microscopy. (auth)

6312

MINERALOGY OF URANIUM. Clifford Frondel (Harvard Univ., Cambridge, Mass.). Am. Mineralogist 42, 125-32 (1957) Mar.-Apr.

6313

AN IMPROVED PROCESS FOR THE PRODUCTION OF URANIUM AND THORIUM METALS. A. Cacciari, R. De Leone, C. Fizzotti, and M. Gabaglio (CISE Labs., Milano). Energia nucleare (Milan 4, 50-2(1957) Feb.

6314

EXTRACTION OF PLUTONIUM AND URANIUM FROM NUCLEAR FUEL. N. Isaac. Industrie chim. belge 22, 139-52(1957) Feb. (In French)

The different methods used for the extraction of Pu from nuclear fuel, irradiated natural U, are reviewed. Two separate groups are considered: (a) processes calling for dissolution of the fuel in aqueous media; (b) methods characterized by the use of high temperature in the absence of water. The advantages and disadvantages of the most common processes are discussed and some purification flowsheets are given. Stress is particularly laid on the solvent extraction method and the fractional distillation of fluorinated derivatives. (auth)

6315

PREPARATION OF PURE U_3O_8 FROM CRUDE SODIUM DIURNATE BY INTERMEDIATE COMPLEX FORMATION. N. S. Krishnaprasad and V. V. Dadape (Atomic Energy Establishment, Bombay, India). Proc. Indian Acad. Sci. 45, 20-3(1957) Jan.

Preliminary studies of the separation of U from Th, rare

earths, and Fe by complexing with KF or NH_4F are reported. (T.R.H.)

6316

ATOMIC POWER FOR PEACE. VOLUME 1. URANIUM. W. J. Vogt. Johannesburg, Union of South Africa, Atomic Power Review, 1956. 28p.

A general history of U is given. The methods of separating U^{235} from U^{238} are described briefly. A flowsheet of the uranium extraction and sulfuric acid plant in the Union of South Africa is presented. The extraction of U from ores and the production of U metal in the Union of South Africa are described. (W.L.H.)

6317

A FLUIDIZED BED PROCESS FOR THE PRODUCTION OF URANIUM TETRAFLUORIDE. N. M. Levitz, E. J. Petkus, H. M. Katz, and A. A. Jonke (Argonne National Lab., Lemont, Ill.). Chem. Eng. Progr. 53, 199-202(1957) Apr.

Advantages of the use of single and multistage fluidized beds over methods now in use are illustrated. Development of a process for improving the reduction and hydrofluorination operations in the production of UF_4 is presented. (W.L.H.)

Refer also to abstract 6306.

WASTE DISPOSAL

6318 UK/C/5/19

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

FIXATION OF HIGHLY ACTIVE WASTES IN SOLID FORM. C. B. Amphlett. Sept. 25, 1956. 17p.

Radioactive species in waste solutions may be fixed by mixing with suitable siliceous materials (e.g. soils, clays, or natural silicate minerals) and firing to high temperatures to produce a ceramic which suffers very little leaching by water or aqueous solutions. Fluxes may be added if required to lower the temperature of melting, without adversely affecting the fixation of activity. Apart from the case of ruthenium under certain conditions, the loss of activity during the firing process is negligibly small. The method is more versatile than one based on ion exchange, and allows slurries and solids to be treated as well as solutions. Comparison is made between these two alternative processes regarding remote operation on a highly active scale, and the development work necessary to scale up the ceramic process is outlined briefly. (auth)

6319

TREATMENT OF HIGHLY ACTIVE WASTES. C. B. Amphlett (A.E.R.E., Harwell). Atomics 8, 116-20(1957) Apr.

The principal methods which have been proposed in order to fix the activity from highly active wastes in solid form are discussed. These include fixation by ion exchange followed by firing, combined calcination and ion exchange, and conversion to unleachable glasses, melts, or ceramics. It is concluded that the ceramic process offers a number of advantages over the ion exchange method. (B.J.H.)

ENGINEERING

6320 ERG-33

[Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.]

LEAK DETECTION IN DOUBLE WALLED HEAT EXCHANGER TUBES. W. E. Simmons. [195?]. Decl. Jan. 30, 1957. 6p.

It is proposed to form heat exchanger tubes with double walls separated by a rectangular thread, enabling heat transfer to take place across the thread and leaving a spiral groove into which any leaks would occur and be capable of detection. The investigation into the time lag in detection of various leaks is described. (auth)

6321 WADC-TR-56-267

Koppers Co., Inc., Pittsburgh.

EVALUATION OF DESIGNS AND MATERIALS FOR HIGH SPEED-HIGH TEMPERATURE SHAFT SEALS FOR TURBOJET ENGINE APPLICATIONS. Ernest J. Taschenberg. Sept. 24, 1956. 71p. Project title: GAS TURBINE TECHNOLOGY. Task title: HIGH TEMPERATURE RUBBING SEALS. Contract AF33(616)-3004. (AD-110636).

With the constant upward trend in operating conditions in aircraft turbojet engines, it has been necessary to redesign engine rubbing shaft seals and find new materials to meet these conditions. This program was initiated to facilitate the development of a shaft seal which would operate satisfactorily under extended conditions of speed, temperature, and pressure. Since shaft seals necessarily involve rubbing surfaces, a large number of materials were investigated to determine those having promising wear characteristics at room temperature and at high tempera ture. The subject of shaft seal design was reviewed with respect to the adaptability of such new materials to the several designs incorporating these materials. (auth)

AEROSOLS

6322 NYO-4610

Harvard Univ., Boston. Air Cleaning Lab.

ELECTROSTATIC MECHANISMS IN AEROSOL FILTRATION BY MECHANICALLY CHARGED FABRIC MEDIA AND RELATED STUDIES. Leslie Silverman, Edward W. Conners, Jr., and David M. Anderson. Sept. 4, 1956. 61p. Contract AT(30-1)-841. $0.40(OTS).

Test results are presented in which a mechanically induced electrostatic charge on certain fabrics is employed as an aid in the removal of particulate matter (atmospheric dust) from air at room temperature. The theory of mechanically induced static charges and some experimental data are presented. (auth)

HEAT TRANSFER AND FLUID FLOW

6323 AECU-3164

California. Univ., Berkeley. Inst. of Engineering Research.

HEAT TRANSFER TO LEAD BISMUTH IN TURBULENT FLOW IN AN ANNULUS. R. A. Seban and D. F. Casey. June 22, 1956. 20p. Convection Research Project. Contract AT-11-1-GEN-10. $0.20(OTS).

Heat transfer coefficients for molten Pb-Bi eutectic are presented for flow in annuli externally heated at a constant rate. Diameter ratios of 1.30 and 1.74 were investigated, and results were obtained for Peclet Numbers from 400 to 1600. These results are shown to be related to analogy predictions for this system in the same manner as exists for pipe flow, and that the theories providing a rationalization of the results for pipe flow do so as well for the flow in an annulus. (auth)

6324 AGC-AE-32

Aerojet General Corp., Azusa, Calif.

DETERMINATION OF BURNOUT LIMITS OF POLYPHENYL COOLANTS. K. Sato. Feb. 15, 1957. 67p.

Contract AT(04-3)-44. (AGC-1225). $0.50(OTS).

An experimental investigation was conducted to establish the burnout limit of liquid diphenyl for various flow conditions. Burnout limits were determined by failure of an electrically heated tube within which the diphenyl flow was controlled. The tube was an annular flow passage with a hydraulic diameter of 0.272 in. A total of 23 tests were conducted over the following range of parameters: System pressure, 197 to 406 psia; Liquid bulk temperature, 572 to 737°F; Liquid bulk velocity, 4.8 to 17.3 ft/sec; Subcooling, 77 to 328°F; and Heat flux, 227,000 to 890,000 Btu/hr sq ft. (auth)

6325 BMI-1163

Battelle Memorial Inst., Columbus, Ohio.

VAPOR FORMATION AND BEHAVIOR IN BOILING HEAT TRANSFER. Richard A. Egen, David A. Dingee, and Joel W. Chastain. Feb. 4, 1957. 51p. Contract NObs-65057.

An experimental program was conducted to study the formation and distribution of vapor in a rectangular channel under boiling-heat-flux conditions at 2000 psia. In addition, the problem of preferential distributions was studied to determine its effect on the validity of the results of this program. Over the range of variables tested, there was no flow-rate effect, and the slip, where determinable, appeared to be constant. The void fraction is correlated with the quality and heat flux, in the vicinity of zero quality; the dependence upon heat flux decreases with increasing quality in this region. Inlet-temperature variation has no effect on the value of the void, providing the inlet temperature is below the temperature necessary for local boiling. (auth)

6326 BMI-1167

Battelle Memorial Inst., Columbus, Ohio.

A STUDY OF ERROR EFFECTS IN MEASURING CYCLIC-TEMPERATURE HEAT-TRANSFER COEFFICIENTS. David A. Dingee and Joel W. Chastain. Feb. 15, 1957. 28p. Contract W-7405-eng-92. $0.25(OTS).

An experimental investigation of the errors associated with the cyclic-temperature method of obtaining convective heat-transfer coefficients was made. The models studied were a large single tube, a bundle of ½-in.-ID tubes, and a bed of randomly packed spheres. In order to measure the error attenuation due to velocity mixing, cyclic dye and cyclic ion pulses were used. It was found that most of the errors at the conditions under study could be explained by velocity mixing. The methods for measuring the attenuation errors were at best only qualitative and no real quantitative correction factor was found. The results do indicate that fluids of high density such as water are not suitable fluids for cyclic-temperature tests to obtain convective heat-transfer coefficients. In future tests, gases are recommended as coolants. It is felt that reliable heat-transfer coefficients can be obtained if gases are used. (auth)

6327 CF-56-9-60

Oak Ridge National Lab., Tenn.

CONDUCTION OF HEAT IN A FINITE PLATE IN CONTACT WITH AN ENVIRONMENT IN WHICH THE TEMPERATURE VARIES AS A PRESCRIBED FUNCTION OF TIME. D. H. Platus and R. V. Meghreblian. Sept. 12, 1956. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

6328 ERI-2323-9-F

Michigan. Univ., Ann Arbor. Engineering Research Inst.

HEAT AND MOMENTUM TRANSFER FROM THE WALL OF A POROUS TUBE. Final Report. Stuart W. Churchill and Harry E. Stubbs. Mar. 1957. 77p. AF Project 77519. Contract AF-18(600)-1335. (OSR-TR-56-58; AD-115001).

Heat and momentum transfer from the wall of a porous tube to a fluid stream flowing in the tube were investigated analytically and experimentally. The investigation was limited to conditions where the main stream in the tube was turbulent and where a secondary flow, small relative to the primary, passed inwards or outwards through the porous wall. This small flow through the wall modified the usual velocity field in the tube and consequently the heat and momentum flux from the wall. (auth)

6329 NP-6243

Michigan. Univ., Ann Arbor. Engineering Research Inst. and Wolverine Tube Div., Calumet and Hecla, Inc., Detroit.

CORRELATION OF HEAT TRANSFER AND PRESSURE DROP FOR AIR FLOWING ACROSS BANKS OF FINNED TUBES. Report No. 30. Donald L. Katz, Edwin H. Young, Richard B. Williams, Garen Balekjian, and Robert P. Williamson. Dec. 1954. 56p. Project 1592.

The lack of a generalized correlation for the outside convection coefficient of gases in cross flow through banks of finned tubes necessitated a study of the available data to provide a procedure for the design of finned-tube banks. Such units have been used either to cool process water or to heat or cool gases. The data for air are correlated by using the tube characteristics and arrangement of the tubes in the units to relate the outside heat-transfer coefficient and the pressure drop with the rate of flow of air. The heat-transfer and pressure-drop correlations for air are generalized for any gas by using the physical properties of the fluid. Two sample calculations are included to illustrate the use of the proposed correlations. (auth)

6330 WAPD-TH-19

[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.]

PRESSURE DROP TESTS– PARALLEL ROD SUBASSEMBLIES WITH VARIOUS END CONNECTIONS. B. W. LeTourneau and R. E. Grimble. Mar. 19, 1955. 20p. $3.30(ph OTS); $2.40(mf OTS).

Experimental pressure drop measurements were made for flow through a series of parallel flow rod subassemblies with various spacer-type end connections. The test results have been evaluated to determine pure friction factors, entrance plus exit loss coefficients, and joint loss coefficients for flow in these subassemblies. Results are presented in graphical form. (auth)

6331 WAPD-TH-82

[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.]

EXPERIMENTAL INVESTIGATION OF PRESSURE DROP THROUGH PARALLEL ROD SUBASSEMBLIES CONNECTED BY TUBE SHEETS OF VARIOUS FLOW AREAS. B. W. LeTourneau and R. E. Grimble. Aug. 15, 1955. 11p. $3.30(ph OTS); $2.40(mf OTS).

Tests were conducted for subassemblies having two different sizes of tube sheet holes, in a Reynolds number range from 10,000 to 140,000. The effect of a 1/16 in. axial spacing at the joint between subassemblies was considered. The test results were evaluated to determine pressure loss coefficients for the joints between subassemblies and for entrance and exit loss coefficients. Results are presented in graphical form. (auth)

6332 WAPD-TH-178

[Westinghouse Electric Corp. Bettis Plant, Pittsburgh].

AN ANALYSIS OF MIXING IN PARALLEL FLOW ROD

BUNDLES. R. E. Grimble and W. H. Bell. [Mar. 1956]. 20p. $3.30(ph OTS); $2.40(mf OTS).

Hot channel factors are products of component factors resulting from deviations from nominal flow and heat transfer values. These component factors are evaluated for the case of flow in parallel rod bundles with mixing. (D.E.B.)

6333 WAPD-TH-183

[Westinghouse Electric Corp. Bettis Plant, Pittsburgh.] PRELIMINARY INVESTIGATION OF THE EFFECT OF VERTICALLY DOWNWARD FLOW ON BURNOUT FLUX. H. S. Jacket, J. D. Roarty, and A. Weiss. [Feb. 1956]. 5p. $1.80(ph OTS); $1.80(mf OTS).

Tests were run at mass velocities of 0.15 to 1.5 $\times 10^6$ lbs/hr-ft^2, inlet subcooling of 10 to 61°F, and a pressure of 2000 psia. The results are plotted and compared with similar up-flow data. No difference in burnout flux due to flow direction is indicated. (D.E.B.)

6334 AEC-tr-2881

INVESTIGATION OF THE NATURAL CIRCULATION OF AN ORGANIC HEAT-CARRIER WITH HIGH BOILING-POINT. F. F. Bogdanov. Translated by M. C. Wheeler from Izvest. Akad. Nauk S.S.S.R. 3, 374-85(1950). 10p.

The results are given of an investigation of useful pressures developed by the vapor–fluid mixture of an organic heat-carrier at natural circulation in a 56 to 70 mm. tube. (T.R.H.)

6335 AEC-tr-2908

HEAT TRANSFER TO NON-NEWTONIAN FLUIDS FOR LAMINAR FLOW THROUGH TUBES. U. Griguil. Translated by F. Hudswell from Chem. Ing. Tech. 28, 553-6(1956). 10p.

6336

NON-STATIONARY WING MOTION IN SUPERSONIC FLOW. G. I. Kopzon. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk. Inst. Mashinovedenia 21, 136-41(1957) Jan.–Feb. (In Russian)

A problem of arbitrary wing motion in conditions which permit the usual assumptions accepted in linearization of equations has been analyzed. (R.V.J.)

6337

INVESTIGATIONS OF THE WATER STREAM EJECTED FROM A NOZZLE UNDER 2000 atm. PRESSURE. L. F. Vereshchagin, A. A. Semerchan, and F. M. Filler. Izvest. Akad. Nauk. S.S.S.R. No. 1, 57-60(1957) Jan. (In Russian)

Investigations were made of a water stream compressed under 2000 to 2500 atm. ejected by a superspeed engine (1000 rpm. with 240 kw motor) with the speed of the order of 600 to 650 m/sec from a round opening of 0.2 to 1.24 mm. The water jet was studied in the immediate vicinity of the various size nozzles on two models, one with 22 mm diameter piston, 1200 liter/h. using 20 to 85 kw at various compressions and the other with 27 mm in diameter, ejecting 1800 liter/h. with 110 to 120 kw at 2000 atm. (R.V.J.)

6338

STUDY OF BOILING IN SHORT NARROW CHANNELS AND ITS APPLICATION TO DESIGN OF MAGNETS COOLED BY LIQUID H_2 AND N_2. S. G. Sydoriak and T. R. Roberts (Los Alamos Scientific Lab., N. Mex.). J. Appl. Phys. 28, 143-8 (1957) Feb.

A study has been made of the critical heat input, $\dot{Q}_C$, to liquid H_2 and N_2 boiling in an annular gap, of cross-section area, A, between a vertical cylindrical heater of height, Z, and various concentric plugs. The data are in approximate agreement with calculations based on an assumption of homogeneous and frictionless two phase flow. The pressure drop across the channel is spent primarily to accelerate the vapor being formed and the liquid carried with it. The derived relation does not contain any empirical coefficients or exponents. For $\rho v_{,2} \ll \rho L$ the general equation reduces to $\dot{Q} = AL(\rho v_{,2}\rho L Z_e g f_2)^{1/2}$, where L is the latent heat of vaporization, $\rho v_{,2}$ the exit vapor density, ρL the liquid density, g the gravitational acceleration, Z_e the hydrostatic head equivalent to the pressure drop across the heater, and f_2 the mass fraction of vapor in the fluid leaving the heater. Forced flow experiments give f_2. At $\dot{Q}_C$ equal to that found in natural convection boiling, $f_2 \doteq 0.5$ for both liquids. For Z = 3 or 6 in. and a channel thickness of 0.022 in. the ratio of observed to calculated $\dot{Q}$ is 0.95 for N_2 and 0.70 for H_2. The calculation is equally good for critical natural convection experiments, $Z_e = Z$, and for subcritical as well as critical forced flow measurements, which extend up to $Z_e = 70$ Z. The optimum operating vapor pressure is discussed for magnets cooled by ideal natural convection boiling. A simple roll-type of coil is discussed and is shown to be superior in some respects to more conventional windings. (auth)

6339

HYDRODYNAMICS OF OSCILLATING DISKS IN VISCOUS FLUIDS: DENSITY AND VISCOSITY OF NORMAL FLUID IN PURE He^4 FROM 1.2°K TO THE LAMBDA POINT. J. G. Dash and R. Dean Taylor (Los Alamos Scientific Lab., N. Mex.). Phys. Rev. 105, 7-24(1957) Jan. 1.

A new study has been made of the viscous component in liquid He II, using the experimental method of Andronikashvili. The hydrodynamic equations for disks oscillating in a viscous medium have been derived from first principles in a form amenable to experimental test of the necessary approximations. Associated studies with several ordinary liquids have yielded an empirical constant for the liquid dragged by the disk corner. The final semiempirical equations of motion appear to provide a significantly better approximation than those previously published. The new formulas have been applied to a combined study of density and viscosity of pure He^4 liquid from 1.2°K to the lambda point, 2.1735°K. Refinements in experimental technique include larger oscillating systems, improved temperature regulation and measurement, and precision chronometry. The theoretical roton temperature dependence of Landau and of Feynman provides a good description of the density between 1.2°, and 2.0°K. The empirical value of the roton excitation energy is found to be $\Delta/k = 10.60$°K. Detailed investigation in the region of the lambda point shows an accelerated rise in the normal fluid density above 2.0°K; the temperature derivative of density tends toward infinity at T_λ. The data confirm the measurements made earlier by Andronikashvili over the entire temperature range. At temperatures below 1.5°K the torsion pendulum results lie significantly lower than those derived from second sound and specific heat data. Viscosities of the normal fluid are in substantial agreement with the earlier results of Andronikashvili and with the viscometer values of Heikkila and Hallett down to 1.5°K. Discrepancies between the oscillating disk and viscometer data below 1.5°K have not been resolved. The temperature dependence of the viscosity near the lambda point indicates that T_λ is a point of strong singularity for both viscosity and normal fluid density. (auth)

MATERIALS TESTING

6340 AECU-3441

Sandia Corp., Albuquerque, N. Mex.

AN INVESTIGATION OF METAL SHELLS AS CUSHIONING DEVICES FOR THE COMPONENT RECOVERY PROGRAM. W. D. LaCoss. Mar. 15, 1957. 10p. (TM-101-56-51). $1.80(ph OTS); $1.80(mf OTS).

A preliminary investigation of the energy absorption and failing characteristics of metal shells that were subjected

to a compressive load has been completed. Results of the tests indicate some advantages of metal shells as cushioning devices as compared to aluminum honeycomb materials. (auth)

6341 AECU-3454
Sandia Corp., Albuquerque, N. Mex.
GENERAL DISCUSSION OF METHODS TO SIMULATE AIRCRAFT AND MISSILE ACOUSTICAL ENVIRONMENT FOR TEST PURPOSES. Charles W. Remaley. Jan. 29, 1957. 20p. Contract AT(29-1)-789. (TM-28-57-16). $0.20(OTS).

Some of the apparatus available for high-intensity sound generation is discussed. There are also included some considerations of the environment to be reproduced with particular reference to the sound frequency spectrum and sound pressure levels required. A reference list is included which will be helpful in securing additional information. (auth)

6342 AERE-ED/R-1467
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
SIZE EFFECT IN MICRO-INDENTATION HARDNESS TESTS. J. Woodrow. July 5, 1954. 22p.

In view of the conflicting experimental evidence for a possible size effect in micro-indentation hardness tests, a theoretical investigation based on dimensional analysis has been carried out. If the indenter is perfect and if the plastic deformation of the specimen is homogeneous, there is no size effect, even when work hardening, friction, anisotropy, and elastic recovery are taken into account. While surface tension does introduce a size effect, this only becomes important at much smaller indentations than those that occur in microindentation hardness testing. Apparent size effects can be introduced by indenter imperfections, and by systematic errors in the load and diagonal. A true size effect can arise only from the non-homogeneity of plastic deformation. (auth)

6343 HW-41394
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
BEARING EVALUATION TESTS OF CARBON GRAPHITE BEARING MATERIALS. J. Dunn and P. B. McCarthy. Feb. 13, 1956. 14p. Contract W-31-109-Eng-52. $3.30 (ph OTS); $2.40(mf OTS).

The results of corrosion tests showed that the common graphite bearing materials are not resistant to concentrated HNO_3 at elevated temperatures. On the other hand, three specially compounded pure graphite materials; Pile Graphite CSGBF, National Carbon Company Graphite CS312, and Carbone Corporation Graphite Carbolube AP80 are resistant to boiling concentrated HNO_3. Although these three materials do not have bearing characteristics equivalent to Graphitars and other carbon graphite mixtures, they will make suitable sleeve bearings. Pile Graphite CSGBF has been given extensive tests in operating pumps where it performed satisfactorily against journals of 309S, 316, and 347 stainless steel. The other graphites have equal, if not better, bearing characteristics and will be similarly tested. Pile Graphite CSGBF is a special graphite made for use in piles and is not directly available to pump vendors. The other suitable materials, National Carbon Company Graphite CS312 and Carbone Corporation Carbolube AP80 are commercially available products and can be used interchangeably as process-solution-lubricated sleeve bearings in separations plant rotating equipment. (auth)

6344 HW-48480
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
GOLD GASKETS FOR PROCESS PIPING. R. W. Wirta. Feb. 14, 1957. 5p. Contract [W-31-109-eng-52]. $1.80 (ph OTS); $1.80(mf OTS).

Gold exhibits excellent physical gasketing properties in that a moderate bolting pressure of 25 ft.-lbs torque on a 1-in. pipe flange can cause a properly designed gasket to flow into relatively large flange face defects to effect a good seal in lines carrying liquids at 90 psig or less. However, galvanic action takes place when Au is in contact with stainless steel in the presence of hot HNO_3, with a resultant accelerated corrosive attack on the adjoining stainless steel. It is concluded that Au gaskets are not suitable for use in stainless steel process piping handling hot oxidizing solutions such as HNO_3. (auth)

PUMPS

6345 AERE-Inf/Bib-93(4th ed.)
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
ELECTROMAGNETIC PUMPS AND FLOWMETERS. A Bibliography of Literature References and Readily Available Reports. M. Greenhill and C. S. Sabel, comps. Oct. 1956. 10p.

55 references.

6346 CEA-560
France. Commissariat a l'Energie Atomique, Paris.
POMPES MOLECULAIRES AUX TRES BASSES PRESSIONS. GENERALISATION. (Molecular Pumps at Very Low Pressures. Generalization.). C. Mercier and P. Benoist. May 7, 1956. 23p.

In an earlier study it was shown by one of the authors that the theory could account for the experimental results on molecular pumps starting from simple assumptions like the absence of collisions between molecules and diffuse reflection by the walls. In the present paper the formulas are extended to the case when the surface velocity of the rotor is no longer negligible compared with the velocity of the molecules; moreover the mathematical treatment is analyzed in more details. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

6347 WADC-TR-56-137
Illinois. Univ., Urbana.
HIGH ALLOY CONTENT CERMETS CONTAINING TITANIUM DIBORIDE AS THE MINOR CONSTITUENT. Final Report [for] March 27, 1954 to September 1, 1955. Tracy A. Willmore and Dwight G. Bennett. Dec. 1955. 19p. Project 3066. Contract AF33(616)-2307. (AD-99655).

Cermets composed of an Inconel "X" type alloy and TiB_2 and X40 alloy and TiB_2 were investigated. Low melting phases were encountered in the first type, with liquid formation at temperatures as low as 2050°F. Due to such low refractoriness, tests with this type cermet were discontinued. X40-TiB_2 cermets showed considerably more promise but erratic firing behavior was experienced when specimens were fired in A or over titanium hydride. It

was concluded that such results were due to traces of O_2 in the atmosphere. Some depression of the melting range of X40 alloy was noted. The role of Ti in the development of the low melting phases was established by adding Ti to the alloy. Due to time limitations the evaluation of high alloy content cermets containing TiB_2 was not completed. (auth)

CORROSION

6348 CF-57-1-144
Oak Ridge National Lab., Tenn.
QUARTERLY REPORT ON THE SOLUTION CORROSION GROUP FOR THE PERIOD ENDING JANUARY 31, 1957. J. C. Griess, H. C. Savage, J. L. English, R. S. Greeley, S. R. Buxton, D. N. Hess, W. C. Ulrich, T. H. Mauney, and E. F. House. Jan. 31, 1957. 48p. Contract [W-7405-eng-26]. $7.80(ph OTS); $3.30(mf OTS).

A second test of the mockup of Zircaloy-stainless steel transition joint as used in the HRT reactor vessel was completed. Long-term runs with UO_2SO_4 solutions of concentration proposed for use in the HRT have shown the solution stable at 300°C. Experiments with chromic acid for pretreatment of stainless steel have shown that, under certain conditions, the pretreated film can exist in UO_2SO_4 in excess of the critical velocity. The praticability of using Ti inserts in highly turbulent areas of stainless steel loops to minimize corrosion was demonstrated. The corrosiveness of $BeSO_4$ solutions containing dissolved UO_3 was determined at 250 and 280°C. Studies on stress-corrosion cracking of stainless steel in boiling UO_2SO_4 containing 25 and 50 ppm Cl^- have shown that it will crack. A number of Zr-base alloys were prepared and tested in UO_2SO_4 for corrosion resistance. (For preceding period see CF-56-10-13. (W.L.H.)

6349 CF-57-3-112
Oak Ridge National Lab., Tenn.
IN-REACTOR AUTOCLAVE CORROSION STUDIES. II. AUTOCLAVE Z-18. K. S. Warren, R. J. Davis, and G. H. Jenks. Mar. 22, 1957. 22p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

In order to test the effect of chromate ion on the corrosion of Zircaloy-2, a 0.04M uranyl sulfate solution containing added acid, copper sulfate, and 557 ppm of Cr (VI) was autoclaved with rocking at 280°C for about eight days in the HB-5 facility of the LITR. The average corrosion rate established by the rate of consumption of oxygen was 9.9 mpy at a power density of 4.9 w/ml. It is indicated by comparison with a previous corrosion study under LITR radiation that the presence of Cr (VI) had no significant effect on the radiation corrosion of Zircaloy-2 by enriched uranyl sulfate solutions. However, the data are not conclusive and may be interpreted as showing a low corrosion rate for a limited period (i.e. a short term inhibition) followed by correspondingly rapid corrosion. (auth)

6350 HW-47695
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
PROCEDURES FOR MEASUREMENT OF ALUMINUM CORROSION. H. C. Bowen and R. A. Thiede. Jan. 14, 1957. 7p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80 (mf OTS).

6351 WAPD-136
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
THE CORROSION PROPERTIES OF ZIRCONIUM-BASE FUEL ALLOYS. S. Kass. Nov. 2, 1955. Decl. Aug. 17, 1956. 41p. Contract AT-11-1-GEN-14. $0.30(OTS).

The corrosion of low U (4 to 15 wt. %) Zr base alloys is characterized by the initial formation of a protective oxide film, followed by a breakdown of the protective film and general spalling. The corrosion resistance of Zr–U alloys decreases with increasing U content. The mechanism of corrosion of the alloys described is probably different in high-temperature water and steam. Tin additions from 0.5 to 2.5 wt. % slightly improve the corrosion properties of Zr–U alloys. Improved corrosion properties are not attained by substituting corrosion-resistant Zircaloy-2 for sponge Zr. Iron additions up to 1% have deleterious effects upon the corrosion properties of Zr–U–Sn ternary alloys. The Zr–4 wt. % U–8 wt. % Nb alloy shows excellent promise as a corrosion-resistant fuel alloy. The oxide films form very slowly and are adherent at least for 84 days in 680°F water. (auth)

6352 AD-101980
NEW PRINCIPLE IN THE INVESTIGATION OF ATMOSPHERIC CORROSION OF METALS. (Novyi Printsip Issledovaniya Atmosfernoi Korrozii Metallov). I. L. Rozenfel'd and T. I. Pavlutskaya. Translated from Doklady Akad. Nauk S.S.S.R. 91, 315-17(1953). 4p. (CTS-81).

GEOLOGY AND MINERALOGY

6353 CEA-556
France. Commissariat à l'Énergie Atomique, Paris.
APERCU SUR LA REPARTITION ET LES CARACTERES GENERAUX DES GISEMENTS D'URANIUM DANS LE MONDE. (SAUF L'UNION FRANCAISE). [Estimate of the Distribution and General Characteristics of Uranium Deposits in the World (Except the French Union)]. A. Gangloff. May 1956. 45p.
Extract from CEA-165.

6354 RME-2029
Division of Raw Materials. Salt Lake Exploration Branch, AEC.
URANIUM INVESTIGATIONS IN MOHAVE COUNTY, ARIZONA. Olin M.Hart. Feb. 15, 1955. 20p. $0.20 (OTS).

Reconnaissance investigations in Mohave County disclosed an apparent relationship of uranium mineralization with post-Paleozoic intrusives which occur sporadically along large north-south trending faults. The uranium minerals occur in lead-zinc veins within the instrusives, disseminated through the intrusive mass, or in veins in close proximity to the intrusives. Limited reserves of commercial grade ore can probably be developed at the Red Hills (Tate) property, and possibly from the new area around Fool's Peak, although considerable exploration work would be required to evaluate the Fool's Peak district. (auth)

6355 RME-2035(Rev.)
Division of Raw Materials. Salt Lake Exploration Branch, AEC.
PRELIMINARY REPORT ON URANIUM OCCURRENCE, SILVER KING CLAIMS, TOOELE COUNTY, UTAH. Robert L. Hillier. Mar. 1956. 15p. $0.55(OTS).

Although diamond drilling carried out on the Silver King claims failed to reveal the presence of significant amounts of uranium, the underground operations have shown that uranium-bearing material of possible commercial significance exists in several northwest-trending veins and faults. The faults and veins may be related to the block faulting along the west side of the Sheeprock Mountains. That these veins served as channels for ascending hydrothermal solutions is evidenced by the alteration halos which surround them. Abundant chlorite, pyrite, and silica are found in the altered areas. Uraninite appears to have been in-

troduced along with pyrite and quartz as a late phase of mineralization. No secondary uranium minerals have been observed in any of the veins in the Silver King area, and it is assumed that some of the uranium in the oxidized material is associated with iron and manganese oxides. The most effective way to explore these veins is by the continuation of underground operations. (auth)

6356 RME-3145
Minnesota. Univ., Minneapolis.
PROGRESS REPORT NO. 11 FOR PERIOD APRIL 1 TO OCTOBER 1, 1956. John W. Gruner. Oct. 1, 1956. 14p. Contract AT(30-1)-610.

6357 TEI-640
Geological Survey.
GEOLOGIC INVESTIGATIONS OF RADIOACTIVE DEPOSITS. Semiannual Progress Report [for] June 1 to November 30, 1956. Dec. 1956. 327p. $1.50(OTS).

Progress on investigations of radioactive materials in the U. S. and Alaska, undertaken by the U. S. Geological Survey is reported. The shift in emphasis of the Geological Survey's program from the search for minable deposits of U as such toward the understanding of geologic conditions favorable for U concentration was continued. No exploration drilling was done. Efforts were directed toward a comprehensive understanding of the factors involved in U geology and the publication of reports that will make available to the public the information obtained in the various studies. Many investigations have progressed to the point where final reports have been completed or are in preparation for future publication. Between June 1 and November 30, 1956, formal publications included twelve Geological Survey Bulletins; 37 maps; 22 publications in scientific journals; and 64 papers by Survey authors in Geological Survey Professional Paper 300. A total of 13 papers were presented at scientific meetings by members of the Geological Survey involved in the investigation of radioactive deposits. Publications issued on the geologic investigations of radioactive deposits during the past six months are listed under the descriptions of the various projects. (For preceding period see TEI-624.) (auth)

6358
DISCORDANT U–Pb AGES AND MINERAL TYPE. J. Laurence Kulp and Walter R. Eckelmann (Columbia Univ., New York). Am. Mineralogist 42, 154-64(1957) Mar.-Apr.

The discordant ages obtained from the isotopic ratios Pb^{206}/U^{238}, Pb^{207}/U^{235}, Pb^{207}/Pb^{206} and Pb^{208}/U^{232} in various minerals are considered in terms of the mineral type. The available pertinent data including some new measurements made at this laboratory are compared. Each mineral structure appears to show a consistent but characteristic discordance, except monazite, which exhibits a dual behavior; i.e., pitchblende 206/238<207/235< probable age; uraninite 208/232<206/238<207/235< probable age; monazite, xenotime 208/232< probable age <207/235<206/238; monazite 208/232<206/238<207/235< probable age; zircon and sphene 208/232<<206/238<207/235< probable age; samarskite, thorite, sphene 208/232<206/238<207/235< probable age; euxenite 206/238<207/235<208/232 = probable age. On the other hand if adequately preserved, concordant ages can be obtained from almost any radioactive mineral. Mineral structures differ considerably in their stability to alteration. For a given mineral the isotopes of lead derived from uranium decay must be in a different lattice environment than the Pb^{208} derived from thorium decay. (auth)

6359
SECONDARY URANIUM MINERALS AT THE W. WILSON MINE IN THE BOULDER BATHOLITH, MONTANA. D. O. Emerson and H. D. Wright (Pennsylvania State Univ., University Park). Am. Mineralogist 42, 222-39(1957) Mar.-Apr.

Secondary uranium minerals found in the W. Wilson mine, near Clancy, Mont., include meta-autunite, meta-uranocircite, meta-torbernite, meta-zeunerite, uranophane, beta-uranophane, phosphuranylite, gummite, and an unidentified mineral, possibly a complex uranium silicate. Uraninite in this "siliceous reef" deposit has been leached and altered by ground water to form the secondary minerals. The deposition of autunite and torbernite as the meta-I hydrate, apparently at normal ground water temperatures, would appear to lower the range of temperature stability previously reported for these minerals. Isomorphous substitution among the four minerals of the meta-torbernite group may be responsible for this difference in stability. Although isostructural with uranophane, the W. Wilson material of this composition has minor discrepancies in its optical character which may be due to the extra Cu, Ba, or Pb in the mineral. (auth)

6360
RADIOACTIVITY AND AGE OF THE EARTH. F. Houtermans. Naturwissenschaften 44, No. 6, 157-63(1957). (In German)

6361
GEOLOGICAL AND ARCHEOLOGICAL DATING WITH C^{14}. O. Haxel. Naturwissenschaften 44, No. 6, 163-9(1957). (In German)

METALS AND METALLURGY

6362 AD-105099
Library of Congress. Technical Information Div., Washington, D. C.
THERMAL PROPERTIES OF CERTAIN METALS. (Abstract Bulletin TP10). Mar. 20, 1956. 27p.

6363 AD-108450
Massachusetts Inst. of Tech., Cambridge. Corrosion Lab.
ABSOLUTE AREAS OF SOME METALLIC SURFACES. Thomas L. O'Connor and Herbert H. Uhlig. June 27, 1956. 17p. [Project] NR 036-007. Contract N5-ori-78, T. O. 15.

6364 AERE-M/R-795A
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
SOME FURTHER EXPERIMENTS ON THE CREEP OF ALUMINIUM IN THE N. R. X. PILE. R. D. Semmens. Feb. 12, 1954. Decl. Jan. 21, 1957. 12p.

Experiments in the N.R.X. pile to determine the effect of irradiation by fast neutrons on the creep rate on annealed aluminum specimens of 99.5% purity are described. In these tests, two tubular specimens were subjected to a hoop stress of 4,310 psi at 50°C in a flux of 8×10^{12} fast neutrons/cm^2/sec. This enhanced flux was achieved locally by carrying out the experiments in a neutron transformer surrounding the specimen. No difference in creep rate between irradiated and unirradiated specimens was observed over a 50-day period. (auth)

6365 BMI-1168
Battelle Memorial Inst., Columbus, Ohio.
THE MECHANICAL PROPERTIES OF ZIRCONIUM AND ZIRCALOY 2. Frederic R. Shober, John A. VanEcho, Lyle L. Marsh, Jr., and John R. Keeler. Feb. 18, 1957. 50p. Contract W-7405-eng-92. $0.35(OTS).

The elevated-temperature tensile properties of Zr and of Zircaloy 2 were investigated and the creep properties were determined at temperatures up to 500°C. The effect of time at test temperature on the tensile strength of the

25% cold-worked materials was investigated. The increased tensile strengths of cold-worked Zr and Zircaloy 2 were reduced to that of the annealed material by holding at 500°C for approximately 90 and 200 hr, respectively. Cold-worked Zircaloy 2 tested in creep had superior 1000-hr rupture strengths for all test temperatures, except 500°C. At 500°C, the 1000-hr rupture strength of the cold-worked material reverted to that of annealed Zircaloy 2 at the same temperature. The stress to produce a creep rate of 10^{-5} %/hr in the annealed Zircaloy 2 was 25,000 psi at 150°C and 3200 psi at 500°C. Hydraulic-bursting tests also were made on seamless Zircaloy 2 and on welded Zr tubing. The bursting pressures were considerably higher in the seamless tubes than in the welded tubing, 6800 psi as compared with 5400 psi at room temperature and 3150 psi versus 2200 psi at 400°C. The welded Zr tubing failed at the longitudinal-seam weld under hydraulic pressure. (auth)

6366 BMI-1169

Battelle Memorial Inst., Columbus, Ohio.

STUDIES OF THE OXIDATION AND CONTAMINATION RESISTANCE OF BINARY NIOBIUM ALLOYS. Chester T. Sims, William D. Klopp, and Robert I. Jaffee. Feb. 19, 1957. 54p. Contract W-7405-eng-92. $0.40(OTS).

A study of the effects of binary alloying additions on the oxidation and contamination resistance of Nb has been conducted. The alloys contained up to 35 at. % Ti, Cr, and Zr, 25 at. % V, Mo, Ta, and W, and 5 at. % Be, B, Co, Fe, Mn, Ni, and Si. The oxidation and contamination studies were conducted in air at 600, 800, and 1000°C. Four elements, Ti, V, Mo, and Cr, improved oxidation resistance. The concentrations for optimum oxidation resistance at 1000°C were 25 at. % Ti, 10 at. % V, 5 at. % Mo, and 25 at. % Cr. Titanium was most effective in reducing the rate of oxidation; at 600 to 1000°C, the Nb-25 at. % Ti alloy oxidized one-tenth to one-twentieth as rapidly as pure Nb. Contamination was investigated by hardness-penetration measurements on all oxidized alloys except those containing Be or B. Zirconium and Ti markedly reduced the depth of O_2 contamination resulting from exposure to air. Diffusion coefficients for O_2 in the Nb binary alloys were calculated, and related by activation-energy plots where possible. Zirconium, Ti, Cr, and V were most effective in reducing O_2 diffusion into Nb. (auth)

6367 CF-57-3-60

Oak Ridge National Lab., Tenn.

HIGH-TEMPERATURE PROPERTIES IN RELATION TO DESIGN. J. R. Weir, R. V. Meghreblian, and D. A. Douglas. Mar. 14, 1957. 23p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

The essential physical and mechanical properties of materials which enter into the design considerations of high-temperature systems were outlined, and the relationship of these factors to the detailed design of structural members noted. Particular attention is given to the phenomenon of strain-cycling and relaxation, and several engineering devices wherein these effects can markedly influence design are mentioned. Techniques and apparatus for the measurement of strain-cycling and relaxation properties are described and some recent data on Inconel at 1500°F is reported. A brief discussion is presented on design-criteria for high-temperature applications, and it is pointed out that in some high-performance devices the considerations of the strain-cycling phenomenon may impose the design philosophy of "steady-state" operation. Some elementary applications of strain-cycling data to design are described, and test experience indicates that analytical techniques can be developed for predicting with reasonable reliability the fatigue life of structures. (auth)

6368 HEC-78

Hooker Electrochemical Co., Niagara Falls, N. Y.

QUARTERLY REPORT FOR JANUARY, FEBRUARY AND MARCH 1957. G. T. Miller. Mar. 29, 1957. 17p. Contract AT(30-1)-1524. $3.30(ph OTS); $2.40(mf OTS).

Studies were continued on the separation of B isotopes and the reduction of boron compounds to elemental boron. A method of fractionation of anisole to effectively remove water was devised which utilized an incolumn takeoff plate. Corrosion studies of metals in anisole–BF_3 at 150°C under anhydrous conditions were completed. Pilot plant production of B^{11} has continued. (For preceding period see HEC-74.) (W.L.H.)

6369 HW-41859

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

A PRELIMINARY STUDY OF THE MECHANICAL PROPERTIES OF M-388, AN ALUMINUM–1% NICKEL ALLOY. D. E. Johnson and W. H. Ellis. Mar. 16, 1956. 17p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

The conclusions which were reached as a result of this preliminary study are from a structural strength standpoint M-388 Al alloy is equal or superior to 2S or 3S Al alloys for service temperatures of 150°C or higher; strain aging occurs at a temperature of 200°C in M-388 Al alloy that has been cold worked by more than 15% reduction in area does not result in a marked increase of the yield strength at test temperatures above 150°C. (auth)

6370 HW-47921

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

FEASIBILITY STUDY ON MAGNESIUM ALLOY PROCESS TUBING FOR ORGANIC COOLANTS. J. W. Lingafelter. [1957]. 7p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Dimensional tolerances, neutron cross sections, and high-temperature creep and tensile yield properties are tabulated for several Mg alloys. These commercially available Mg alloys do not appear to be suitable for use in an organic coolant loop at 600°F and 400 psi. (T.R.H.)

6371 KAPL-M-DBK-2

Knolls Atomic Power Lab., Schenectady, N. Y.

EVALUATION OF SEAL WELD JOINT DESIGNS. D. B. Kittle. Jan. 17, 1957. 8p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

The convex type seal weld ruptured in a ductile manner indicating good weld quality. These welds also had high bursting strengths. The concave type weld, had a somewhat lower than desired bursting strength. The average bursting strength of these concave type welds was 3,050 psi lower than the average bursting strength of the convex welds with only 63% penetration. This low bursting strength of the convex welds is to be expected because the semicircular tubing tends to deflect and turn inside out. The tubing turns outward putting the root of the weld, where a notch already exists, in tension causing severe deformation of the weld before fracture occurs. It appears that, wherever possible, the convex type canopy weld should be used in place of the concave type. (auth)

6372 KAPL-M-DBK-2(Suppl. 1)

Knolls Atomic Power Lab., Schenectady, N. Y.

EVALUATION OF SEAL WELD JOINT DESIGNS. K. H. Koopman and D. B. Kittle. Mar. 12, 1957. 14p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

6373 KAPL-M-JLV-2

Knolls Atomic Power Lab., Schenectady, N. Y.

CREEP RESISTANCE OF 2¼ CR 1 MO STEEL IN THE ANNEALED, NORMALIZED AND TEMPERED, AND COLD

WORKED CONDITIONS. J. L. Van Ullen. Jan. 18, 1957. 11p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80 (mf OTS).

The low and high temperature strength of 2¼ Cr 1 Mo can be improved by heat treatment. This characteristic should improve the service performance of cold expanded duplex boiler tubes. 5% cold work reduces the high temperature creep resistance of both annealed and normalized and tempered 2¼ Cr 1 Mo steel. (auth)

6374 KAPL-M-JMG-6

Knolls Atomic Power Lab., Schenectady, N. Y.

WELDING OF TITANIUM TO HAFNIUM. J. M. Gerken and S. A. Toftegaard. Dec. 18, 1956. 8p. Contract W-31-109-eng-52. $1.80(ph OTS); $1.80(mf OTS).

Good quality welds can be made between pure Hf and pure Ti using the inert-gas-shielded tungsten-arc process. Best results were obtained by welding with a single-pass on each side and adjusting current and travel speed to obtain approximately ⅔ penetration into the Ti on each pass. The fusion zone was considerably harder and stronger than either of the joined materials as a result of alloying. (J.E.D.)

6375 NACA-TN-3842

National Bureau of Standards, Washington, D. C.

CREEP BEHAVIOR OF STRUCTURAL JOINTS OF AIRCRAFT MATERIALS UNDER CONSTANT LOADS AND TEMPERATURES. Leonard Mordfin and Alvin C. Legate. Dec. 12, 1955. 53p.

The results of 55 creep and creep-rupture tests on structural joints are presented. Methods are described by which the time to rupture, the mode of rupture, and the deformation of joints in creep may be predicted. These methods utilize creep data on the materials of the joint in tension, bearing, and shear. (auth)

6376 NACA-TN-3462

Langley Aeronautical Lab., Langley Field, Va.

TENSILE PROPERTIES OF 7075-T6 AND 2024-T3 ALUMINUM-ALLOY SHEET HEATED AT UNIFORM TEMPERATURE RATES UNDER CONSTANT LOAD. George J. Heimerl and John F. Inge. July 1955. 46p.

Results are presented of tests to determine the effect of heating at uniform temperature rates from 0.2° to 100°F per second on the tensile properties of 7075-T6 (75S-T6) and 2024-T3 (24S-T3) Al-alloy sheet under constant-load conditions. Yield and rupture stresses, obtained under rapid-heating conditions, are compared with results of elevated-temperature stress-strain tests for ½ hr exposure. Master yield- and rupture-stress curves based on a linear temperature-rate parameter are presented. Yield and rupture stresses and temperatures may be predicted by means of master curves and the parameter. (auth)

6377 NAVORD-3948

Naval Ordnance Lab., White Oak, Md.

VACUUM EVAPORATION OF HEAVY METALLIC FILMS. W. R. Turner. June 2, 1955. 33p.

The development and operation of vacuum evaporation equipment capable of forming metallic films 10 to 40 times the thickness obtained in commercial practice are described. On the basis of the equation defining the rate of metal transfer to the surface being coated, the primary requirement for the evaporation of a heavy film is a source of comparatively large area. Such a source was devised in the form of a flat tantalum dish heated by electronic bombardment. Important aspects of the development include the design of a water-cooled fixture to hold the evaporation dish, an electronic circuit breaker to control the bombardment power supply, and an electrical thickness gage to record the film thickness as it is evaporated. Although only a limited number of metals have been evaporated, the method is believed to be applicable to a wide range of metals, alloys, and non-metals. (auth)

6378 NP-6245

Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.

THE HEAT TREATMENT OF Ti-6Al-4V. Feb. 12, 1957. 19p.

The Ti-6Al-4V alloy is an α-β alloy and its heat treatment is designed to adjust the relative proportions of the two phases and their distribution. Generally the same factors that influence heat-treatment response in other alpha-beta alloys apply to this alloy, but there are important differences. The heat treatments and their resultant properties are presented, followed by a discussion of the physical metallurgy of the alloy. (auth)

6379 NP-6253

Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.

THERMAL CONDUCTIVITY OF TITANIUM AND TITANIUM ALLOYS. J. W. Holladay. Mar. 11, 1957. 4p.

Supersedes data in TML-39.

Summary of available data on thermal conductivity of Ti and Ti alloys is presented. (auth)

6380 NP-6254

Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.

BIBLIOGRAPHY ON SURFACE HARDENING OF TITANIUM AND TITANIUM ALLOYS. Mar. 6, 1957. 7p.

A bibliography on surface hardening of Ti and Ti alloys has been prepared from references that are readily available in the Titanium Metallurgical Laboratory Information Center. (auth)

6381 NP-6255

Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.

THE EMISSIVITY OF TITANIUM. Mar. 15, 1957. 7p.

Data on emissivities of different grades of Ti at various temperatures are summarized. (auth)

6382 NP-6258

Illinois Inst. of Tech., Chicago. Armour Research Foundation.

MEASUREMENT OF THERMAL PROPERTIES. Progress Report No. 3 [for] January, February, and March 1957. J. I. Lang and I. B. Fieldhouse. Apr. 10, 1957. 12p. ARF Project No. D106. Contract AF33(616)-3701.

Tabulations of the results of measurements of thermal properties of stainless steels, Stellite 21, Hastelloy B and C, and Be are presented. (auth)

6383 NP-6259

Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.

ARC WELDING TITANIUM. Mar. 21, 1957. 34p.

A summary is presented of information useful in setting up arc-welding procedures and selecting alloys. The characteristics of titanium that have the greatest effects on welding operations and the surface preparation, welding procedures, and the mechanical properties of welded joints are discussed in detail. 37 references. (auth)

6384 NP-6261

[Massachusetts Inst. of Tech., Cambridge.]

A SEGREGATION SUBSTRUCTURE IN ALUMINUM. Frank B. Cuff, Jr., and Nicholas J. Grant. [1957]. 30p.

A fine (~1μ) structure observed on the surface of chemically polished Al has been investigated. On the basis of various observations of the Al surface both in the annealed and deformed condition, the structure was concluded to be a surface manifestation of an underlying

three-dimensional network. A physical model for the existence of these structures is proposed which is based on the segregation of impurity atoms. (auth)

6385 NP-6262
Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.
TITANIUM PROGRESS TO DATE. Harry B. Goodwin. Mar. 25, 1957. 24p.

A review of the history, development, production, industrial uses, and properties of Ti is briefly outlined. (J.E.D.)

6386 ORNL-2280
Oak Ridge National Lab., Tenn.
REMOTE WELDING OF STAINLESS STEEL CONTAINERS. E. E. Pierce. Apr. 22, 1957. 10p. Contract W-7405-eng-26. $0.15(OTS).

Equipment for sealing stainless steel cylinders containing radioactive materials by remotely operated-shielded-arc welding has been fabricated and successfully operated. The equipment consists of two portable units. One of the units, including a rotating chuck and electrode positioner, is operated in a cell equipped with model 8 master-slave manipulators. The power supply unit and control panel are of conventional design and are operated outside the cell. Containers varying in size from ¼ in. to 3 in. in diameter by 11 in. long may be sealed either by a side weld or an end weld. (auth)

6387 OSR-TN-56-402
Columbia Univ., New York.
EFFECTS OF SOLID ENVIRONMENTS ON THE BRITTLE FRACTURE OF ZINC SINGLE CRYSTALS. L. C. Weiner and M Gensamer. Aug. 24, 1956. 37p. Contract AF18(600)-898. (AD-96060).

The normal fracture stress of Zn single crystals oriented $\chi_0 = 3°$ tested in tension at room temperature was increased 43% upon applying a surface film of Cu, Au, ZnO, Sn or Zn greater than about 500 A. This increase was independent of film thickness above this value. In addition, the total percent elongation was increased twofold, the primary mode of deformation being twinning accompanied by parent basal slip both prior to and subsequent to twinning, as well as basal slip within the twins. Metallographic examination revealed a difference in the internal structure of clean and coated crystals, namely, the number and distribution of twins. There were more twins in the coated crystals, and they were more uniformly distributed. In contrast, the fracture stress of crystals oriented $\chi_0 = 80°$ was 48% less than the value observed with clean surfaced crystals. The presence of pre-existing twins produced by precompression caused the fracture stress of both clean and coated crystals to be increased. These results as well as observations in prestrain, recovery and film removal experiments have been explained by a dislocation model in which twins play an important role, modifying the dislocation-path and acting as barriers. (auth)

6388 OSR-TN-57-150
Princeton Univ., N. J. Forrestal Research Center.
HIGH TEMPERATURE OXIDATION OF IRON–NICKEL ALLOYS. Metallurgy Report No. 12. M. J. Brabers and C. E. Birchenall. Mar. 25, 1957. 23p. Contract AF18(600)-967. (AD-126439).

The Fe-rich corner of the phase diagram for Fe–Ni–O was determined at 1050°C. Great care was taken to assure equilibration which was not completely achieved in an earlier study. The mechanism of oxidation of Fe–Ni alloys is discussed and a protective mechanism is described which differs somewhat from those suggested for other alloys. (auth)

6389 SEP-227
Sylvania Electric Products Inc. Atomic Energy Div., Bayside, N. Y.
FUNDAMENTALS OF DIFFUSIONAL BONDING—I. First Annual Progress Report, June 30, 1955 to June 30, 1956. L. Castleman and L. Seigle. Aug. 13, 1956. 38p. Contract AT-30-1-GEN-366. $0.30(OTS).

A detailed study has been initiated of the formation of intermediate layers in the diffusion zone of Al-Ni diffusion couples. It has been confirmed that only two out of four possible layers form observably during diffusion (the Ni_2Al_3 and $NiAl_3$ phases). The growth of the intermediate layers occurs initially at a rate different from that predicted by the ideal diffusion equations; however, once a minimum thickness is reached, behavior becomes more normal. (auth)

6390 SEP-229
Sylvania Electric Products Inc. Atomic Energy Div., Bayside, N. Y.
FUNDAMENTALS OF SINTERING—I. First Annual Progress Report [for] June 30, 1955 to June 30, 1956. A. Pranatis and L. Seigle. Oct. 5, 1956. 20p. Contract AT-30-1-GEN-366. $0.20(OTS).

A study was made of the mechanism of sintering in pure oxides and metals. In order to ascertain whether the sintering rate of Cu_2O is controlled by the diffusion of Cu ions, the effect of O pressure upon the sintering rate was measured. The sintering rate increased with the O pressure as predicted, but the results were not in quantitative agreement with the Wagner theory. Furthermore, the activation energies for sintering were less than one third those for the diffusion of Cu^+ in Cu_2O. Interpretation of the results was complicated by an exaggerated grain and void growth during sintering, which undoubtedly affected these rates. Further studies of metal wire compacts with embedded inert markers support a diffusional mechanism of sintering, but the marked inhibition of shrinkage by the "inert" markers is not yet understood. (auth)

6391 WADC-TR-53-230(Pt. III)
Illinois Inst. of Tech., Chicago. Armour Research Foundation.
STUDY OF EFFECTS OF ALLOYING ELEMENTS ON THE WELDABILITY OF TITANIUM SHEET. [Period covered] February 7, 1955 to August 31, 1956. John F. Rudy, Joseph B. McAndrew, and Harry Schwartzbart. Sept. 1, 1956. 150p. Project title: METALLIC MATERIALS. Task title: TITANIUM METALS AND ALLOYS. Contract AF33(616)-206. (AD-118135).

A study of the effect of C, N_2, and O_2 on the weldability of Ti-base alloys is presented. The alloys studied were: 5 Al–Ti, Al–3 Mo–Ti, 25 V–Ti, and Al–4 V–Ti. (See also WADC-TR-53-230(Pt. II).) (W.L.H.)

6392 WADC-TR-56-580
Mallory-Sharon Titanium Corp., Niles, Ohio.
THE EFFECT OF VARIOUS HEAT TREATMENT CYCLES UPON THE MECHANICAL PROPERTIES OF TITANIUM ALLOYS WITH VARIOUS INTERSTITIAL LEVELS. [Period covered] January 1, 1955 to June 30, 1956. Benjamin F. Hadley, G. William Bauer, and Dillon Evers. Dec. 14, 1956. 214p. Project title: METALLIC MATERIALS. Task title: TITANIUM METAL AND ALLOYS. Contract AF33(616)-2795. (AD-118118).

The effect of various heat treatments on the mechanical properties of ⅝-in. diameter bar from four Ti alloys of five interstitial content levels each was determined. Three major types of heat treatment were employed: a solution treatment and age cycle, a step quench cycle and a solution treatment, isothermal transformation cycle. The alloys

investigated were Ti–5Al Complex (Ti–5Al–1.7Cr–1.6Fe–1.6Mo), Ti–3Mn Complex (Ti–3Mn–1Cr–1Fe–1Mo–IV), Ti–6Al–4V and Ti–4Al–4Mn. Interstitial levels were low (100 BHN sponge base), high O (.24%), high N (.07%), intermediate O and N (.16% and .04% respectively) and high C (.2%). Three-hundred-hour creep tests were performed on materials of interstitial levels 1, 2, and 4. The elevated temperature tensile properties, room temperature notch strength, and Charpy impact data of material of interstitial level 4 were determined. Beta transi, T-T-T curves and end quench curves were determined for all material. The effect of section size on the mechanical properties and heat treatment response of the Ti–5Al complex alloy was determined. (auth)

6393 WAL-401/79-33

Battelle Memorial Inst., Columbus, Ohio.

THE EFFECT OF HYDROGEN ON THE MECHANICAL PROPERTIES OF TITANIUM–ALUMINUM ALLOYS. Interim Report. L. W. Berger, D. N. Williams, and R. I. Jaffee. Mar. 1, 1957. 25p. Project No. TB 4-15. Contract DA-33-019-505-ORD-7.

The effects of H on the properties of binary Ti–Al alloys containing 2.5, 5, and 7% Al were studied. Increasing the Al content increases the apparent solubility of H, which accounts for the property trends determined. Hydrogen additions up to 230 ppm have little effect on the strength of unalloyed Ti and no deleterious effect on tensile ductility. Notch-bend impact strength, however, was seriously lowered by adding 80 ppm H, an addition which was sufficient to show hydride in the structure. The properties of Ti-2.5Al were similarly affected by H with hydride appearing in the microstructure at the lowest addition studied, 75 ppm. In the Ti–5Al and Ti–7Al alloys, hydride did not appear in the microstructure until 315 and 415 ppm, respectively, were added. This increased solubility of H resulted in considerable strengthening without loss in ductility as well as increased tolerance to impact embrittlement. A loss in tensile reduction in area was noted when hydride was present, as a result of the grain boundary distributions of that phase. Loss in impact strength also occurred at the first appearance of hydride. Whether or not high Al contents increase H solubility is still open to question, as there is some evidence that the effect is one of retarding hydride precipitation. If so, these alloys may be susceptible to slow strain embrittlement. (auth)

6394 WAL-401/272

New York Univ., New York. Coll. of Engineering.

DEVELOPMENT OF TOUGH, HIGH-STRENGTH, QUATERNARY TITANIUM-BASE ALLOYS OF THE Ti–Al–V–X SYSTEM. Interim Technical Report No. 1. William F. Kirk and Harold Margolin. Nov. 1956. 103p. Project No. DA-5B93-08-021. Contract DAI-30-069-505-ORD-(P)-1506.

Attempts were made to develop alloys of yield strength of 150,000 psi or greater with adequate ductility and toughness. A group of twenty $1\frac{1}{4}$ lb ingots was prepared. The quaternary compositions were based on the Ti–Al–V alloys in which Al content varied from 4 to 8%, the V from 2 to 4%, and other additions from 2 to 4%. The aging behavior for three or four solution temperatures and four aging temperatures was studied. Jominy end-quench tests and a few tensile tests were also carried out. The alloys are to be more fully evaluated as 6 lb ingots. Other 6 lb ingots are to be investigated as a result of the data obtained, and finally the Ti–6Al–4V and three other alloys will be investigated as 25 lb ingots. (auth)

6395 AEC-tr-2883

THE ELECTRICAL STABILITY OF THIN LAYERS OF ALUMINIUM OXIDE. S. N. Koikov and A. N. Tsikin. Translated by V. Beak from Zhur. Tekh. Fiz. 26, 2248-53(1956). 13p.

6396 AEC-tr-2900

THE POSSIBILITY OF USING SIMILARITY METHOD TO DETERMINE LIQUID-METAL PARAMETERS. I. M. Kirko and O. A. Lielausis. Translated by M. C. Wheeler from Fiz. Metal. i Metalloved. Akad. Nauk S.S.S.R., Ural. Filial 2, 563-4(1956). 2p.

6397 AEC-tr-2901

DIFFUSION OF COBALT IN COBALT–ALUMINUM ALLOYS. S. D. Gertsriken and I. Ya. Dekhtyar. Translated by J. Adam from Fiz. Metal. i Metalloved. Akad. Nauk S.S.S.R., Ural. Filial 3, 242-6(1956). 8p.

6398

ZIRCONIUM AS A REACTOR MATERIAL. F. R. Paulsen. Atomics 8, 121-3(1957) Apr.

The use of zirconium in the nuclear industry is discussed. General discussions are included on the extraction, purification, neutron economy, and corrosion of Zr. (B.J.H.)

6399

Ni ALLOYS SHINE AT HIGH TEMPERATURES. R. M. Wilson, Jr. and W. F. Burchfield (International Nickel Co., New York). Chem. Eng. 64, No. 5, 298, 300, 302, 304, 306(1957) Apr.

The properties of some Ni alloys which make them suitable for use at high temperatures are discussed. Embrittlement problems, behavior in fabrication, welding, and cleaning are topics included. (T.R.H.)

6400

AN APPROXIMATE CALCULATION OF SURFACE TENSION OF METALS. S. N. Zadumkin (Kabarda State Pedagogical Inst.). Doklady Akad. Nauk S.S.S.R. 112, 453-6 (1957) Jan. 21. (In Russian)

An approximate calculation of the σ for metals by the thermal evaporation method is presented. A table is given of the experimental values of σ and γ for various melted metals. (R.V.J.)

6401

INVESTIGATIONS OF THE INTERNAL FRICTION IN γ AND α PHASES OF HIGH CHROMIUM STEEL. Yu. V. Pirguzov (Stalin Moscow Inst. of Steel). Doklady Akad. Nauk S.S.S.R. 112, 636-9(1957) Feb. 1. (In Russian)

A specially prepared steel containing 1.05% C, 11.90% Cr, and 0.012% N was investigated to determine the internal friction dependence on temperature. The analysis of thermal treatments of the samples at various temperatures up to 1200° is given in graphical form. Tables of lattice parameters and phase structures are included. (R.V.J.)

6402

SOME DATA ON HETERODIFFUSION COEFFICIENTS IN Cu–Ni, Fe–Ni, Fe–Cr ALLOYS WITH DISTORTED AS WELL AS NOT DISTORTED CRYSTALLINE LATTICES. E. F. Chaĭkovskiĭ. (Gor'kiĭ Khar'kov State Univ.) Doklady Akad. Nauk S.S.S.R. 112, 716-19(1957) Feb. 1. (In Russian)

6403

POLONIUM MONOSULPHIDE. K. W. Bagnall and D. S. Robertson (Atomic Energy Research Establishment, Harwell, Berks). J. Chem. Soc. 1044-6(1957) Mar.

Polonium monosulfide was prepared on the milligram scale; its decomposition under vacuum has been used as the basis of a new method for the preparation of pure Po. (auth)

6404

THE MECHANISM OF TITANIUM PRODUCTION BY ELECTROLYSIS OF FUSED HALIDE BATHS CONTAINING TITANIUM SALTS. J. G. Wurm, Lucien Gravel, and Roger J. A. Potvin (Laval Univ., Quebec, Can.). J. Electrochem. Soc. 104, 301-8(1957) May.

Titanium was produced by electrolyzing a molten bath of a NaCl and KCl mixture containing K_2TiF_6, and Na_2TiF_6. The formation of trivalent Ti double fluorides of Na and K always preceded the production of metallic Ti during the electrolysis. These new trivalent Ti compounds were positively identified as K_2NaTiF_6, K_3TiF_6, and Na_3TiF_6. Free metallic Na was deposited at the same time as Ti when using a cooled cathode. This fact together with the measured polarization voltage and the presence of trivalent Ti compounds indicate that production of metallic Ti proceeds by secondary reactions in two steps: first, tetravalent Ti is reduced to the trivalent state; second, trivalent Ti is finally reduced to metallic Ti. (auth)

6405

DEPOSITION OF ACTIVITIES FROM THORIA SLURRIES. K. M. Glover and D. J. O'Connor (Atomic Energy Research Establishment, Harwell, Berks). J. Inorg. and Nuclear Chem. 4, 135-6(1957) Mar.

It was found that in agitation of stainless steel, Zr, and Zircaloy discs in aqueous ThO_2 slurries a preferential plating of the Ra daughters of natural Th occurs. (W.L.H.)

6406

THE DEVELOPMENT OF NIOBIUM. A. B. McIntosh (U. K. Atomic Energy Authority, Industrial Group, Culcheth). J. Inst. Metals 85, 367-72(1957) Apr.

Niobium is of interest for atomic-energy purposes because of its high melting point, excellent compatibility with U, good high-temperature strength, and suitable physical mechanical properties. The metal shows excellent corrosion-resistance to all acids except HF but is rapidly penetrated by caustic alkalis. With pure liquid metals, Nb is satisfactory for service at 600° C and upwards, but the corrosion rate is markedly increased by small O_2 concentrations. The possible development of alloys possessing high-temperature strength and oxidation resistance is discussed, and it is concluded that alloys with selected transition metals with interstitial solute additions may be of interest for both purposes. (auth)

6407

THE MELTING POINT OF NIOBIUM. T. H. Schofield (National Physical Lab., Teddington, Middlesex). J. Inst. Metals 85, 372-4(1957) Apr.

The melting point of Nb has been redetermined by a technique which avoids the use of refractories. Under approximately full-radiator conditions, the melting point of samples containing about 0.12% gaseous impurities (O_2 and N_2) and 1.9% Ta is 2468° ± 10° C. It is probable that the value for the pure metal is not substantially different. (auth)

6408

THE PHYSICAL AND MECHANICAL PROPERTIES OF NIOBIUM. C. R. Tottle (Dounreay Works, Caithness). J. Inst. Metals 85, 375-8(1957) Apr.

The possible employment of Nb or its alloys in reactor components is partially dependent on its possesing suitable physical and mechanical properties. It was therefore necessary to assemble accurate data, covering the range of temperatures involved in reactor operation, on thermal expansion, thermal conductivity, and tensile and creep properties, using metal of a suitable standard of purity for fabrication into complex shapes. Experimental methods already established for metals readily attacked by atmospheric gases were employed. Thermal conductivity is shown to increase, and tensile properties to decrease relatively slowly, with rise in temperature. Tensile properties are markedly affected by small additions of oxygen and creep measurements are susceptible to serious error if oxygen gains access to the system during long periods of test. Reference is made to preliminary results on the effect of alloying elements. (auth)

6409

PURIFICATION OF NIOBIUM BY SINTERING. I. LABOTORY INVESTIGATION OF PURIFICATION BY SINTERING. II. DEVELOPMENT OF A COMMERCIAL SINTERING PROCESS. W. G. O'Driscoll and G. L. Miller (U. K. Atomic Energy Authority, Industrial Group, Culcheth). J. Inst. Metals 85, 379-84(1957) Apr.

The purification of Nb by sintering in vacuo has been studied on both a laboratory and a commercial scale. Gaseous impurities were eliminated by vacuum treatment at temperatures up to 2300° C. When both elements were present, simultaneous removal of O_2 and C as CO was achieved. In the presence of O, Si was also eliminated as SiO. Ductile massive Nb, containing O_2 0.05, N_2 0.01, and C and Si <0.01 wt.-%, has been prepared on a commercial scale. (auth)

6410

THE PRODUCTION AND FABRICATION OF MASSIVE NIOBIUM METAL. L. R. Williams (U. K. Atomic Energy Authority, Springfields Lab., Salwick, Lancs). J. Inst. Metals 85, 385-92(1957) Apr.

An account is given of two possible methods — melting and compacting and sintering — for producing massive ductile niobium from the powder obtained by reduction processes. Both methods demand the use of temperatures over 2000° C. and a high vacuum to minimize contamination and promote the removal of impurities. The powder-metallurgy technique offers the more promising possibilities, and a detailed description is given of the methods of processing developed by the U. K. Atomic Energy Authority. In conclusion, reference is made to the cold-working and welding properties of ductile niobium. (auth)

6411

TEMPER BRITTLENESS OF BORON-TREATED STEELS. Samuel J. Rosenberg. J. Research Natl. Bur. Standards 58, 175-87(1957) Apr.

Two series of steels, melted to the base composition of 8140, were studied to ascertain whether Ti and Zr (present in many commercial B addition agents) had any adverse effect upon the impact properties of the base steels, particularly with reference to temper brittleness. The results obtained indicate that with fully hardened steels tempered at 1,200°F, the presence of relatively small amounts of Ti as introduced into the test steels by the B addition agents is sufficient to cause an impairment in the Charpy V-notch impact properties of the steels or an increased susceptibility to temper brittleness, or both. This was confirmed by the addition of Ti without B. Similar effects, previously thought possibly due to the presence of Zr, were not observed. (auth)

6412

TENSILE PROPERTIES OF COPPER, NICKEL, AND 70-PERCENT-COPPER–30-PERCENT-NICKEL AND 30-PERCENT-COPPER–70-PERCENT-NICKEL ALLOYS AT HIGH TEMPERATURES. William D. Jenkins, Thomas G. Digges, and Carl R. Johnson. J. Research Natl. Bur. Standards 58, 201-11(1957) Apr.

Short-time tensile tests were made at temperatures ranging from 75 to 1,700°F on high-purity nickel, copper, a 70% Ni–30% Cu alloy, and a 70% Cu–30% Ni alloy. The high-purity component metals and the two alloys were investigated in the initial conditions, as annealed for a uni-

form grain size, and as cold-drawn 40% reduction in area. The results were affected markedly by variations in the nickel content, temperature, and degree of cold-working. However, the effects of cold-drawing at room temperature were obliterated at temperatures above that of recrystallization. The effects of cold-drawing the 30% Ni–70% Cu alloy different amounts and of variations in grain size of the Cu on the tensile properties are evaluated. Results on the tensile properties of the same annealed materials at low temperatures are included for completeness. (auth)

6413

THE ELECTRONIC STRUCTURE OF PALLADIUM–URANIUM ALLOYS. J. A. Catterall (National Physical Lab.). Phil. Mag. (8) 2, 491-8(1957) Apr.

The measured effects of uranium upon the paramagnetic susceptibility, electrical resistivity, thermoelectric power, and lattice parameter of palladium are discussed, and an interpretation of the results in terms of a solvent and solute band is suggested. (auth)

Refer also to abstracts 6295 and 6313.

PHYSICS

6414 AECU-3442

Gould-National Batteries, Inc., St. Paul.

A KAPITZA TYPE NICKEL CADMIUM BATTERY. Quarterly Report No. 7 [for] January 1957 to April 1957. E. Willihnganz. [Apr. 1, 1957]. 7p. Contract [AT(30-1)-1831]. $1.80(ph OTS); $1.80(mf OTS).

A battery using improved NiO plates was tested. The average output per/cm^2 was 2.28 w, or 0.034 joules. A second battery was built using a thinner NiO positive plate. This delivered 2.0 amp/cm^2 at an average of 1.0V for 0.001 sec. Investigation of the life of these batteries was started. (W.L.H.)

6415 AERE-C/R-1716

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

ELECTROCAPILLARITY. D. J. O'Connor. Aug. 7, 1955. 8p.

The methods for studying electrochemical and electrical double layer phenomena at metal-solution interfaces are discussed in relationship to electrocapillary phenomena. (auth)

6416 CEA-545

France. Commissariat à l'Énergie Atomique, Paris.

DEPOTS ELECTROPHORETIQUES DE BORE, SUR PLAQUES DE DURALUMIN DESTINES A DES MESURES DE FLUX DE NEUTRONS. [Electrophoretic Deposits of Boron on Duralumin Plates to be Used for Measurements of Neutron Flux]. F. M. Lang, P. Magnier, and C. Finck. Apr. 19, 1956. 11p.

6417 DTMB-804

David W. Taylor Model Basin, Carderock, Md.

THE DIFFUSION OF AIR INTO A PULSATING CAVITATION BUBBLE. Leonard Pode. Mar. 1955. 21p.

A calculation is made of the growth of a cavitation bubble through the diffusion of air induced by the spherically symmetrical mechanical motion of the pulsating bubble. The equation of motion of the boundary is derived from energy considerations. Kinetic theory is applied to determine the boundary conditions for the diffusion equation. The diffusion equation is treated by means of the approximation that the diffusion takes place in a very small layer of water about the boundary. Numerical results are obtained for one case of a strongly pulsing bubble. It is found that the growth per period is relatively small unless the bubble is extremely tiny. (auth)

6418 IMM-NYU-197

New York Univ., New York. Inst. for Mathematics and Mechanics.

UNDERWATER EXPLOSION BUBBLES. II. THE EFFECT OF GRAVITY AND THE CHANGE OF SHAPE. Ignace I. Kolodner and Joseph B. Keller. June 1953. 29p. Contract Nonr-285(02).

A theory is presented which describes the change of shape and the rise of underwater explosion bubbles by taking account of gravity. It is assumed that the water is unbounded, and incompressible and that the pressure is always uniform throughout the bubble and the bubble is spherical initially. (T.R.H.)

6419 NAVORD-3605

Naval Ordnance Lab., White Oak, Md.

RADIATION CHARACTERISTICS OF CIRCULAR AND SEMICIRCULAR SURFACE SOURCES. A. I. Mahan. Dec. 30, 1953. 43p.

A theoretical study of the radiation characteristics for both semicircular and circular surface sources has been made, when these sources radiate uniformly over their surfaces and obey Lambert's Cosine Law. This study includes a presentation of the history of the development of such formulae from the time of Lambert in 1760 up to the present. Very general equations for both types of sources have been derived giving the total flux falling on an elementary receiving area, when this elementary receiving area has arbitrary coordinates and a surface normal with arbitrary direction cosines. The classical method of surface integration, introduced by Lambert, has been used in each case. These equations are very general in form, and it is shown how each of the equations found in the literature becomes a special case of these more general equations, in which the coordinates of the elementary receiving area or the direction cosines of its surface normal have particular values. After a simple translation and rotation of coordinates, these equations can be used for the equally important problem of calculating the total flux falling on the elementary receiving area in the presence of an array of such sources having arbitrary coordinates and surface normals with arbitrary direction cosines. A numerical example of radiation field calculations for each of these sources is given. (auth)

6420 NYO-7967

New York Univ., New York. Atomic Energy Commission Computing Facility.

BUCKLING OF SHALLOW SPHERICAL SHELLS UNDER EXTERNAL PRESSURE. Edward L. Reiss. Apr. 1, 1957. 23p. Contract AT(30-1)-1480. $4.80(ph OTS); $2.70(mf OTS).

A formula for the initial buckling loads for clamped, shallow spherical shells under uniform external pressure is obtained by combining the solutions of two linearized versions of the original nonlinear problem. One of these versions is a linear eigenvalue problem, while the other is the bending problem for a shallow cap in the linear theory of elasticity. The formula, which is obtained in a simple manner, yields buckling loads that are in better agreement with experiments than previous approximate solutions to the nonlinear problem. (auth)

6421 WADC-TR-56-222(Pt. I)

Illinois Inst. of Tech., Chicago. Armour Research Foundation.

DETERMINATION OF EMISSIVITY AND REFLECTIVITY DATA ON AIRCRAFT STRUCTURAL MATERIALS. PART I. TECHNIQUES FOR MEASUREMENT OF TOTAL NOR-

MAL EMISSIVITY AND REFLECTIVITY WITH SOME DATA ON COPPER AND NICKEL. Period Covered: May 1955 to May 1956. Howard T. Betz, O. H. Olson, B. D. Schurin, and James C. Morris. June 1956. 50p. Project title: MATERIALS ANALYSIS AND EVALUATION TECHNIQUES. Task title: THERMAL MEASUREMENTS. Contract AF33(616)-3002. (AD-110458).

Equipment was designed, constructed, and calibrated for the measurement of total normal emissivity in the range -300 to + 3000°F. The procedure consists in comparing the total normal radiance of a sample to that of a comparison blackbody, the ratio of the signals being taken as the emissivity. A thermistor detector is used in conjunction with a folded optical system to record the radiation which is chopped at 16 cps. Measurements of the total normal emissivity for a limited number of samples have been completed. The normal spectral emissivity measurements are obtained by an optical pyrometer method, which relates the true temperature of a sample to its apparent brightness temperature. A Leeds and Northrup disappearing filament pyrometer is used to make these measurements. An integrating sphere reflectometer is used to measure spectral reflectivity from 0.3 to 3.0 μ. This utilizes a Perkin-Elmer monochromator, a comparison type integrating sphere and a PbS cell detector. Spectral reflectivity data can be combined with solar spectral energy data for any location to obtain the solar absorptivity at that point. (auth)

6422 AEC-tr-2885

THE RETARDATION OF THE ELECTRODIFFUSION OF HYDROGEN IN IRON AND STEEL BY SURFACE COATINGS OF CERTAIN METALS. L. I. Freiman and V. A. Titov. Translated by T. Turton from Zhur. Fiz. Khim. 30, 882-8(1956). 15p.

The effect of electrolytic deposits of Pb, Sn, Cu, and Ni on the electrodiffusion of H through Fe and steel membranes on introduction into an electrolyte (H_2SO_4) with the salt $NaAsO_2$ as the poison was investigated. The experiments were carried out on an apparatus, differing from apparatus of the type normally used. (auth)

6423 AEC-tr-2897

ELECTRODE POLARIZATION BY THE SUPERPOSITION OF ALTERNATING CURRENT ON DIRECT CURRENT. I. THEORY. H. Gerischer. Translated by R. C. Murray from Z. physik. Chem. (Frankfurt) (N.F.) 1, 278-99(1954). 19p.

6424 DTMB-Trans-132

SPEED OF RISE OF AIR BUBBLES IN LIQUIDS. (Steiggeschwindigkeit von Luftblasen in Flussigkeiten). T. Bryn. Translated by F. A. Raven from Forsch. Gebiete Ingenieurw. 4A, 27-30(1933). 9p.

The rate of rise of air bubbles of different volumes in glycerin–water and alcohol–water is determined by their size and Laplaces' constant. Small or spherical bubbles do not behave as solid spheres. Their rate of rise depends on the manner in which replacement of their boundary layer occurs. (auth)

6425

A SURVEY OF ATOMIC CONSTANTS. J. A. Bearden and John S. Thomsen. Baltimore, The Johns Hopkins University. 145p.

Recent adjustments of the atomic constants have shown a serious discrepancy between the adjusted value of λ_g/λ_s (the conversion factor from the Siegbahn x-ray scale to absolute units) and the accepted average of the direct experimental results by ruled grating measurements. As an attempt to resolve this discrepancy and for other reasons, a general survey of the atomic constants has been made. Much information which is chiefly of historical interest has been included. An attempt was made to reevaluate errors wherever this appeared necessary and to choose the most reliable experiments for inclusion in the present adjustment. (auth)

6426

SOLID STATE PHYSICS. VOLUME 2. ADVANCES IN RESEARCH AND APPLICATIONS. Frederick Seitz and David Turnbull, eds. New York, Academic Press Inc., 1956. 477p.

Papers are included on nuclear magnetic resonance, electron paramagnetism and nuclear magnetic resonance in metals, the applications of neutron diffraction to solid state problems, the theory of specific heats and lattice vibrations, and the displacement of atoms during irradiation. (B.J.H.)

6427

SOLID STATE PHYSICS. VOLUME 3. ADVANCES IN RESEARCH AND APPLICATIONS. Frederick Seitz and David Turnbull, eds. New York, Academic Press Inc., 1956. 597p.

Papers are included on the properties of the group III-group V compounds, the continuum theory of lattice defects, order-disorder phenomena in metals, phase changes, relations between concentrations of imperfections in crystalline solids, and ferromagnetic domain theory. (B.J.H.)

Refer also to abstract 6339.

COSMIC RADIATION

6428

THE FLUCTUATION PROBLEM IN μ-MESON BURSTS. A. N. Mitra (Muslim Univ., Aligarh, U. P., India). Nuclear Phys. 3, 262-72(1957) Apr.

The effect of the fluctuation problem on the size-frequency distribution of large cosmic-ray bursts is investigated in some detail, assuming the μ meson to be an ordinary Dirac particle. This is achieved with the help of a general distribution function called the Polyá distribution, which reduces to the previously investigated Poisson and Furry cases at appropriate limits. It is found that the fluctuation of the number of shower particles has a considerable influence on the size of cosmic ray bursts, and this result partially obscures any conclusion that may be made on the spin of the μ meson with the help of burst-production data. (auth)

6429

INVESTIGATION OF SHOWER BURSTS CAUSED BY COSMIC PARTICLES OF HIGH ENERGY. V. V. Alpers, I. I. Gurevich, et al. Doklady Akad. Nauk S.S.S.R. 112, 33-6 (1957) Jan. 1. (In Russian)

Studies were made of shower bursts treated in the emulsion chamber. The emulsion chamber, composed of 100 layers 10 cm in diameter and 450 μ each, was irradiated in the stratosphere, at 27 km. elevation, for 7 hr, in May, 1955. Only the showers with relativistic track number of $n_s \geq 5$, located in a sufficiently narrow cone and the stream with the number of relativistic tracks of $n_s \geq 3$ were recorded. The 26.5 cm^3 of investigated emulsion showed 27 shower bursts and 29 jets. Two of the jets originated from the stars, the rest were electron-photon showers. The shower bursts were observed on the 90 × 15 × 1.5 magnification microscope. The initial particle which induced the shower, the number of relativistic particles in the shower, and the angular distribution of shower particles in relation to the axis of the shower were determined. The angles in the emulsion plane α and in the dipping angle β were measured with an accuracy of 1°. The angular distribution of the

shower particles with respect to the shower axis were determined on a special apparatus constructed by V. V. Alpers. (R.V.J.)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

6430 AEC-tr-2878
CRYSTALLOGRAPHY: AN X-RAY DIFFRACTION METHOD FOR STUDYING THE FORMATION AND STRUCTURE OF SUPERFICIAL LAYERS. Jean-Jacques Trillat. Translated from Compt. rend. 242, 3089-92(1956). 4p.

6431
CRYSTALLOGRAPHIC DATA: YTTRIUM TRIFLUORIDE, YF_3, ORTHORHOMBIC FORM. SAMARIUM TRIFLUORIDE, SmF_3, ORTHORHOMBIC FORM. YTTERBIUM TRIFLUORIDE, YbF_3, ORTHORHOMBIC FORM. LANTHANUM TRIFLUORIDE, LaF_3. NEODYMIUM TRIFLUORIDE, NdF_3. Eugene Staritzky and L. B. Asprey (Los Alamos Scientific Lab., N. Mex.). Anal. Chem. 29, 855-7(1957) May.

6432
RECRYSTALLIZATION DIAGRAM OF IODIDE ZIRCONIUM. E. M. Savitskiĭ and V. F. Terekhova. (Baĭkov Inst. of Metallurgy, Acad. of Sciences U.S.S.R.). Doklady Akad. Nauk S.S.S.R. 112, 276-8(1957) Jan. 11. (In Russian)

A crystallization diagram has been constructed for the bars of iodide zirconium (99.7 Zr) prepared by cold rolling with 50% compression followed by 1 hr annealing at 600°. Deformation of these specimens was followed by cold compression from 2.5 to 90% at 10% intervals with 1 hr annealing at 500, 550, 600, 700, 800, 900, 1000, and 1200°. Annealing of the cold-rolled specimens considerably affected the size and shape of the grain. Specimens annealed in the Zr α-modification range (up to 800°) had even polyedric structure; the annealing in the β range (900 to 1200°) caused a sharp increase of the grain and change of the form. Roentgengrams, microstructures, table of hardness and the recrystallization diagram are presented. (R.V.J.)

ELECTRICAL DISCHARGE

6433 AEC-tr-2882
RADIATION EMITTED BY AN ELECTRON MOVING UNIFORMLY IN A PLASMA IN A MAGNETIC FIELD. A. A. Kolomenskiĭ (Kolomensky). Translated by R. C. Murray from Doklady Akad. Nauk S.S.S.R. 106, 982-5(1956). 6p.

A theoretical study is made of the Cherenkov effect in electronic plasma which is placed in a magnetic field. (B.J.H.)

INSTRUMENTS

6434 AECU-3438
Sandia Corp., Albuquerque, N. Mex.
THE DC DESIGN OF RELIABLE MULTISTABLE CIRCUITS. R. H. Williams. Mar. 19, 1957. 90p. (TM-73-57-14). $13.80(ph OTS); $4.80(mf OTS).

An analysis is given of a particular multistable circuit of order N which is herein called the nthnary. Criteria are developed, in terms of N, which can be used to design functionally adequate nthnaries from the point of view of DC stability, and which take into account the expected tolerances of resistors and tubes. Particular nthnaries such as binaries, ternaries, etc., can be designed by substituting 2, 3, etc. for N in the design criteria. A figure of merit is defined which can be used to find the best tube type for nthnary application. Several other facets of nthnary design are discussed regarding their effects on the circuit's reliability. No analysis is performed regarding the nthnary's transient response. (auth)

6435 AECU-3439
Du Pont de Nemours (E. I.) & Co. Savannah River [Lab.], Augusta, Ga.
ANNUAL KINETIC IMPACTOR. Period Covered: March 2, 1956 to April 9, 1956. J. E. Hoy. Aug. 7, 1956. 7p. (DPSPU-56-11-30). $1.80(ph OTS); $1.80(mf OTS).

An annular impactor was designed for use with a Staplex air sampler. The collection efficiencies for radioactive particles in air were determined by collecting the samples on a tray coated with Dow Corning 200 fluid. It was found possible to detect the maximum permissible concentrations of alpha, beta, and gamma-emitting contaminants by sampling for a 10-minute period. Collection efficiency for these contaminants was approximately 95%. This compares favorably with the 98% collection efficiency of Whatman No. 41 filter paper. The collection efficiency for the radon decay products, however, was 5% for the impactor and 50% for the Whatman No. 41 sampler. (auth)

6436 AECU-3440
Sandia Corp., Albuquerque, N. Mex.
AN ANALYSIS OF SOME PROPOSED SAMPLING PLANS FOR ACCEPTANCE OF THE SA-112 CAPACITORS. D. B. Owen. Mar. 14, 1957. 24p. Contract AT-(29-1)-789. (TM-38-57-51). $4.80(ph OTS); $2.70(mf OTS).

Various sampling plans are outlined and points on their operating characteristic curves presented. Some of the plans make use of an exponential life distribution for the SA-112 capacitors. (auth)

6437 AECU-3457
Sandia Corp., Albuquerque, N. Mex.
D-10 TIMER. R. Creveling. Apr. 16, 1957. 6p. Contract AT(29-1)-789. (TM-96-57-14). $1.80(ph OTS); $1.80(mf OTS).

The D-10 timer is designed to operate directly on a negative voltage step and, despite its simple circuitry, is capable of producing extremely accurate time delays. (auth)

6438 BNL-2917
Brookhaven National Lab., Upton, N. Y.
SELECTION OF THE INPUT TUBE FOR A LOW-NOISE PREAMPLIFIER. A. T. Moffet and R. L. Chase. [1956]. 4p. $1.80(ph OTS); $1.80(mf OTS).

A study was made of a number of common tube types which might be suitable for use in the preamplifier for an ionization chamber used in α spectrometry. The line width for simulated α pulses with several tube types are tabulated. The E83F appears to be the best tube for low noise preamplifier service. (B.J.H.)

6439 CEA-551
France. Commissariat à l'Énergie Atomique, Paris.
AMPLIFICATEUR A COURANT CONTINU A REPONSE LINEAIRE OU LOGARITHMIQUE. (A Direct Current Amplifier with Linear or Logarithmic Response). J. Ailloud and P. Chandanson. Apr. 4, 1956. 16p.

The conditions governing the construction of an instrument with logarithmic response, capable of measuring currents between 10^{-10} A and 10^{-4} A are examined. Descriptions are given of a type of stabilized direct current amplifier, designed particularly to operate in a pile control board, giving indications proportional either to the power, or to the log of this power, and which may also be linked to an instrument for measuring reactivity. (auth)

6440 CEA-555
France. Commissariat à l'Énergie Atomique, Paris.
UN APPAREILLAGE DE MESURE DE TEMPS DE DOUBLEMENT. (An Instrument for Measuring Doubling Time). J. Ailloud and P. Chandanson. May 1956. 13p.

The instrument described here allows the direct and

almost immediate measurement, with a precision of the order of 1 per cent, of the time taken by a reactor to double its power. The method of measurement consists of noting the instants when the power of the reactor passes the levels P_1 and P_2 such that $P_2 = 2\ P_1$, and of measuring the time lapse between these two instants. The instrument picks out, in the course of one rise in power, several levels, P_1, P_2, P_3 ... etc., chosen in such a manner as to give several successive measurements of the doubling time. It is also capable of making these same measurements when the reactor is working below the critical level. (auth)

6441 CEA-590

France. Commissariat à l'Énergie Atomique, Paris. STABILISATION DU GAIN DES PHOTOMULTIPLICATEURS. (Stabilization of Photomultiplying Gain). O. Tretiakoff and Bailly du Bois. June 5, 1956. 13p.

The use of photomultiplier tubes in experimental physics is limited by their high responsiveness to changes in the imput voltage. Their use can be extended a great deal by a simple efficient stabilizing device which allows them to operate in the same way as Geiger-Mueller tubes without losing the advantages characteristic of photomultiplier tubes. (auth)

6442 CISE-52

Centro Informazioni Studi Esperienze, Milan. POWER SERVOAMPLIFIERS WITH SWITCHING TRANSISTORS. E. Gatti and G. Giannelli. Aug. 1, 1956. 15p.

A new amplification technique is described that consists in the production by a magnetic modulator of width-modulated pulses. These pulses are width-amplified by switching transistors and eventually drive output transistors also used as switches, with output powers of many times the transistor dissipation. (auth)

6443 OSR-TN-56-584

Texas. Agricultural and Mechanical Coll., College Station. A HIGH RESOLUTION, LOW FIELD NUCLEAR MAGNETIC RESONANCE SPECTROMETER. R. W. Mitchell and M. Eisner. Nov. 1956. 15p. Contract AF18(600)-1300. (AD-115008).

A nuclear magnetic resonance spectrometer has been constructed and its performance at 12 and 43 gauss is discussed. The magnetic field is obtained with an end corrected solenoid powered by batteries. The best resolution obtained is 10 microgauss at 12 gauss and 20 microgauss at 43 gauss over a 30 cm^3 sample. A twin-T bridge and a synchronous detector are employed for the nuclear resonance detection. Some of the measurements for which this instrument is suited are described and the results of relaxation time measurements for ethanol–water mixtures are presented. (auth)

6444 WAPD-168

Westinghouse Electric Corp. Bettis Plant, Pittsburgh. JOINT BETTIS–KAPL NUCLEATE BOILING DETECTION EXPERIMENT. J. M. Hogan and L. R. Boyd. Feb. 1957. 32p. Contract AT-11-1-gen-14. $0.25(OTS).

Three methods for detection of nucleate boiling were proposed and tested. These were (1) a hydrophone mounted inside the water space downstream of the boiling area for passive listening to identify any sound characteristic of boiling, (2) an external accelerometer rigidly connected to the heater (through a low-impedance seal) to study heater vibrations characteristic of boiling, and (3) a receiver hydrophone downstream of the boiling area to measure the attenuation of sound from an upstream input hydrophone as the sound passes through the boiling area. The conclusions reached as a result of these tests are that (1) passive listening with a single internal hydrophone or accelerometer is not feasible, although some small-scale accelerometer indications obtained at 800 psi, 350°F, and 5 fps velocity might be improved, and (2) the attenuation method does show promise for a system of boiling detection but may have major difficulties as far as use in a reactor system is concerned. However, only one valid attenuation test was run before a hydrophone failed; additional testing would be necessary to fully evaluate the transmission method. In addition, it is concluded that the present experimental hydrophone design is inadequate under these simulated reactor conditions and that boiling detection by sonic methods in a reactor would involve an extensive transducer development and application program. (auth)

6445 AEC-tr-2898

SELF-OSCILLATOR SYNCHRONIZATION BY RADIO PULSES. (Sinkhronizatsiia Avtogeneratora Radioimpulsami). E. S. Voronin and G. N. Berestovaki. Translated from Radiotekhnika 11, 34-40(1956). 16p.

A theoretical and experimental investigation of the process of synchronization of an oscillator of harmonic vibrations through rectangular radio pulses is presented. (W.L.H.)

6446 AERE-Lib/Trans-677

THE LUMINESCENCE CAMERA. E. K. Zavoiskii, M. M. Butslov, A. G. Plakhov, and G. E. Smolkin. Translated from Soviet Research in Nuclear Solid State Phys., Collection No. 2, 5-7(1955). 9p.

6447

FAST COINCIDENCE WITH FAST DISCRIMINATORS. Rangalal Bhattacharyya and Santimay Chatterjee (Inst. of Nuclear Physics, Calcutta). Indian J. Phys. 31, 53-5(1957) Jan.

A simple arrangement using fast discriminators with a fast coincidence circuit has been described. With this a resolving time of ten milli-microseconds can be easily obtained. The main features of this arrangement are its stability and simplicity. (auth)

6448

TRANSFORMERS IN NUCLEAR INSTRUMENTATION. T. P. Lynott (Gardners Radio Ltd.). Nuclear Power 2, 135-8 (1957) Apr.

A résumé is presented of current design and manufacture of transformers with reference to nuclear applications. (W.L.H.)

ISOTOPES

6449

B-10 PLANT INVITES NON-AEC CUSTOMERS. Chem. Eng. 64, No. 5, 176, 178(1957) Apr.

The applications, availability, and cost of boron with 61 to 95% B^{10} enrichment are discussed. (T.R.H.)

6450

PRODUCTION AND ANALYSIS OF ISOTOPES. W. Walcher. Naturwissenschaften 44, No. 6, 132-44(1957). (In German)

6451

ISOTOPES IN ORGANIC CHEMISTRY. Friedrich Weygand. Naturwissenschaften 44, No. 6, 169-76(1957). (In German)

Refer also to abstract 6212.

ISOTOPE SEPARATION

6452

ELECTROMAGNETIC SEPARATION BY HERMES. Nuclear Power 2, 132-4(1957) Apr.

The Heavy Element Radioactive Material Electromagnetic

Separator is in principle a mass spectrograph. Positively charged ions travelling at constant high velocity enter a field of an electromagnet where they are deflected from their straight path into an arc of a circle whose radius depends on the mass of the particle. The apparatus is versatile and could be used for any element, but at the present it is being used to separate and collect in the milligram range, quantities of the four Pu isotopes, 239 to 242, in order to investigate their fission absorption cross sections. (W.L.H.)

6453

COMPLEX DISTILLATION SEPARATES ISOTOPES. Chem. Eng. 64, No. 5, 149-50(1957) May.

A distillation process is described using 6 columns with a total height of 350 ft (360 transfer units) and producing boron with a 92 to 93% B^{10} enrichment. Dimethyl ether, produced on the site, is complexed with BF_3 and fed into the distillation unit. The enriched complex is converted to KBF_4 and electrolyzed. Plant output is about 1000 lb. B^{10}/yr. (T.R.H.)

MASS SPECTROGRAPHY

6454

RADIOFREQUENCY MASS SPECTROMETER. E. F. Doil'nitsyn, A. I. Trubetskoĭ, and M. Ya. Shcherbakov. (Novosibirsk Inst. of Mining and Geology). Zhur. Tekh. Fiz. 27, 404-9(1957) Feb. (In Russian)

The construction scheme and tests made on the Bennet radiofrequency mass spectrometer for the analysis of light and inert gases are described. (R.V.J.)

MATHEMATICS

6455 AECU-3451

Sandia Corp., Albuquerque, N. Mex.

DISTRIBUTION-FREE TOLERANCE LIMITS. D. B. Owen. Mar. 28, 1957. 12p. Contract AT(29-1)-789. (TM-66-57-51. $3.30(ph OTS); $2.40(mf OTS).

A method is reviewed for setting a limit such that the probability is α that at least the proportion β of future observations will be greater than (or less than) this limit. The method has great generality because no assumptions except continuity are necessary as to the form of the underlying distribution. The method may be used to establish reliability of a component when sufficient numbers of the component are measured. (auth)

6456 CEA-599

France. Commissariat à l'Énergie Atomique, Paris.

SOUSTRACTEUR D'IMPULSIONS A MEMOIRES. (Impulse Abstractors with Memories). M. Le Baud. Nov. 5, 1956. 8p.

The abstractor described uses several properties of bistable circuits simultaneously in order to store, delay and connect the impulses. After considering the principle of its operation, several actual applications and some possible further uses of the apparatus are described. (auth)

6457 CF-57-4-56

Oak Ridge National Lab., Tenn.

CURVE PLOTTING ROUTINE FOR THE ORACLE. M. P. Lietzke. Apr. 11, 1957. 27p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

A general program has been written to plot curves on the Oracle curve plotter. A description of the code and complete instructions for preparation of input tapes and operation of the code are given. The code tape is available from the Mathematics Panel or from the author. (auth)

6458 GAT-DM-455

Goodyear Atomic Corp., Portsmouth, Ohio.

RIGHT CIRCULAR CYLINDER, SOLID ANGLE CALCULATIONS. John A. Pond. July 5, 1956. 11p. Contract [AT(33-2)-1]. $3.30(ph OTS); $2.40(mf OTS).

For a system of two identical cylinders having a common base plane, approximations are developed for the solid angle subtended at an external point by one cylinder and the average solid angle subtended by one cylinder over the lateral surface of the other. (B.J.H.)

6459 KAPL-1638

Knolls Atomic Power Lab., Schenectady, N. Y.

THE USE OF DIGITAL COMPUTING EQUIPMENT FOR PROCESSING NEUTRON CROSS-SECTION DATA. E. L. Morgan, M. L. Yeater, and N. D. Scheib. Feb. 20, 1957. 20p. Contract W-31-109-eng-52. $0.20(OTS).

6460 SC-2991(TR)

Sandia Corp., Albuquerque, N. Mex.

A REMARK ON THE OVERLAP OF TWO CIRCLES. Aug. 21, 1953. 8p. $1.80(ph OTS); $1.80(mf OTS).

Suppose that the dropping of two circular regions on a given plane are independent events, and that the randomness in the position of fall of the center of each region is characterized by a circular normal distribution about its aiming point. The determination of the probability $P_0(w)$ that the overlap of these regions is at least a specified number w, and the expected value E_0 of the overlap is treated. Examples are given to illustrate how $P_0(w)$ and E_0 may be computed with the aid of the Sandia Corporation nomographs and scales for off-center aiming. (auth)

6461 SC-3831(TR)

Sandia Corp., Albuquerque, N. Mex.

THE BIVARIATE NORMAL PROBABILITY DISTRIBUTION. D. B. Owen. Mar. 1957. 136p. Contract AT(29-1)-789. $0.65(OTS).

This report was formerly issued Aug. 1, 1956; re-issued Mar. 1957 with corrections and revisions.

The bivariate normal probability distribution has many applications, including double sample acceptance procedures with known standard deviations, systems analyses involving two correlated normal variables, bombing studies involving circular or elliptic normal probabilities over polygons, certain types of heat transfer problems, models relating test limits to specification limits, and many others. The table and discussions in this report are principally concerned with the calculation of bivariate normal probabilities where the boundaries of the region over which the probabilities are computed are straight lines. An elliptical boundary is discussed and the present state of knowledge on the trivariate and higher-dimensional normal distributions is outlined. A list of integrals related to the normal densities is included and should prove useful in further theoretical work. (auth)

6462 SC-3896(TR)

New Mexico. Univ., Albuquerque.

ACCURACY IN CALCULATING ARITHMETICAL PROBLEMS OF VARYING COMPLEXITY. George M. Peterson, James L. Evans, and Roger J. Weldon. Oct. 1956. 88p. For Sandia Corp. Contract [AT-(29-1)-789]. $13.80(ph OTS); $4.80(mf OTS).

Different ways of performing arithmetical computations were studied to find methods which would reduce errors to a minimum. Eleven different methods were tested experimentally, using college students in mathematics as computers. Of the methods studied, partnership work, in which two computers work a problem separately and then check with each other, was definitely superior. Several types of self-check methods were investigated. All gave results significantly less accurate than the partnership method,

but all were significantly better than unchecked computation. Four worksheets with 'good' and 'poor' features were tested. None gave results significantly better or worse than work done on a blank sheet of paper. Increasing the complexity of the problems worked did not increase the error rate beyond that expected after adjustment for the greater amount of time required. The most frequent errors involve the more common arithmetical processes, such as addition, subtraction, transcription, and multiplication. No tendency was found for computers to repeat errors consistently except in immediate recomputation of a problem. (auth)

6463 WAPD-TM-39
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
THE CALCULATION OF THERMAL CONSTANTS AVERAGED OVER A WIGNER-WILKINS FLUX SPECTRUM: DESCRIPTION OF THE SOFOCATE CODE. (704 Obtaining Constants at Thermal Energies). Harvey Amster and Roland Suarez. Jan. 1957. 32p. Contract AT-11-1-GEN-14. $0.25(OTS).

The SOFOCATE code for the IBM-704 performs neutron spectrum calculations for neutrons in equilibrium with a hydrogen-moderated homogeneous mixture. This code achieves a much faster production rate than the previously used DONATE code for the IBM-650. There is some loss in flexibility with the new code since only two choices of mesh spacing are available and energies above 2 ev cannot be treated. (D.E.B.)

6464 AEC-tr-2854
ON THE EQUATIONS OF THE THEORY OF PLASTICITY. V. V. Sikolovskii (Sikolovsky). Translated from Priklad. Mat. i. Mekhan. 19, 41-54(1955). 20p.

The fundamental relations between the stress components and the rate of deformation under the general condition for plasticity are formulated without assuming non-compressibility of the material. The equations for plane plastic equilibrium are investigated in detail and different methods of transforming them are shown. A method of solving these equations is given in the form of trigonometric series. The forms of the condition for plasticity are examined in which the equations for plane plastic equilibrium have the simplest coefficients. (auth)

6465
MATHEMATICS AND COMPUTERS. George R. Stibitz and Jules A. Larrivee. New York, McGraw-Hill Book Company, Inc., 1957. 234p.

A general discussion is given of the principles and uses of computers in mathematics. Discussions are included on topics such as numerical analysis, the design of digital computers, analog computers and simulators, computing with random numbers, and computer errors. (B.J.H.)

MEASURING INSTRUMENTS AND TECHNIQUES

6466 AECU-3435
Illinois Inst. of Tech., Chicago. Armour Research Foundation.
EFFICIENCY OF SCAVENGING DEVICES USED IN DETERMINING FALLOUT. Progress Report No. 5 [for] February 1, to March 15, 1957. John Rosinski. 14p. ARF Project C 082. Contract AT(11-1)-375. $3.30 (ph OTS); $2.40(mf OTS).

Design characteristics are described for a device to sample fall-out on the ground, with provisions for deposition on vertical surfaces and for sampling under dry conditions or during precipitation. The proposed unit consists of artificial grasses mounted on a sponge base fitted above a plastic bag. The sampler will be mounted flush with surrounding grass, with the support and collecting bag sunken into the ground. Schematic sketches are included. (C.H.)

6467 AECU-3452
Los Alamos Scientific Lab., N. Mex.
COINCIDENCE TECHNIQUES FOR CYCLOTRON EXPERIMENTS. J. A. Northrop, R. H. Stokes, and Keith Boyer. [1957]. 4p. Contract [W-7405-Eng-36]. $1.80 (ph OTS); $1.80(mf OTS).

A brief discussion is given of the considerations involved in making coincidence measurements between a counter system and another counter when a continuous source of charged particles, such as a cyclotron, is used. In particular the technique was used to study the energy spectrum of protons in coincidence with fissions. (B.J.H.)

6468 AERE-EL/M-74
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
INTERIM MODEL OF CORONA STABILIZER E.H.T. SUPPLY. J. Sharpe and P. Holton. Oct. 22, 1952. Decl. Feb. 6, 1957. 7p.

The circuitry and performance characteristics of power supplies employing corona stabilizer tubes are given. Two types, one for use with proportional counters and one for use with Geiger counters, are considered. (D.E.B.)

6469 AF-SAM-56-109
Texas. Univ., Austin. Radiological Lab.
COMPARATIVE X-RAY DOSIMETRY. Sanford C. Sigoloff, Loren C. Logie, Henry M. Borella, and John C. Tourville. Apr. 19, 1956. 5p.

This paper presents the application of two technics, the Victoreen R-meter and a chemical dosimeter system, to obtain readings under properly filtered and improperly filtered x-ray exposure conditions. Both systems were NBS calibrated before experimentation. The x-ray source employed was a self-rectifying, half-wave, 260 kvp, 18 ma therapeutic unit; filtration conditions were varied. Large discrepancies in the dose indications of the two dosimetric systems used point up the need for proper filtration in the employment of x-ray. Several recommendations are discussed in detail. (auth)

6470 CEA-587
France. Commissariat à l'Énergie Atomique, Paris.
EXPLOSION NUCLEAIRE ET CONTAMINATION INTERNE. (Nuclear Explosion and Internal Contamination). A. Aeberhardt. July 6, 1956. 27p. (In French)

The hazards of internal contamination following nuclear explosions are discussed. Curves are presented for use in calculations of radiation dosage from fission products at various times following an explosion. These curves are applied to some practical applications. (C.H.)

6471 HW-48712
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
PIG THYROID MONITOR. L. D. Test, L. J. Seigneur, and L. K. Bustad. Feb. 19, 1957. 31p. Contract W-31-109-Eng-52. $0.25(OTS).

A mobile, two detector counter developed for monitoring I^{131} in pig thyroids is described which has a sensitivity of 1400 c/m/μc and a normal background of 500 c/m. The maximum sensitivity is limited by short term background fluctuations and was found to be almost 0.5 μc in vivo. Sodium iodide scintillation detectors provide the high sensitivity, and a simple energy analyzing circuit discriminates against background radiation. Vertical and horizontal adjustment of the detecting elements, protec-

tion from animal contact, exclusion of forcible restraint, and noncriticality of thyroid position are provided. (auth)

6472 AEC-tr-2893

INVESTIGATIONS OF RADIOACTIVE RAIN. Walther Gerlach. Translated from Atomkernenergie 1, 237-44 (1956). 16p.

6473

A SCANNING APPARATUS FOR THE LOCALIZATION OF GAMMA EMITTING ISOTOPES IN VIVO. Lars Jonsson, Lars-Gunnar Larsson, and Inger Ragnhult. Acta Radiol. 47, 217-28(1957) Mar.

A motor-driven directional scintillation counter with automatic recording for the localization of γ-emitting radioisotopes in vivo is described. (auth)

6474

TRANSMISSION DOSE MEASUREMENT FOR COBALT 60 RADIATION WITH SPECIAL REFERENCE TO ROTATION THERAPY. Sylvia O. Fedoruk, and H. E. Johns (Saskatoon Cancer Clinic, Saskatchewan, Can.). Brit. J. Radiol. 30, 190-5(1957) Apr.

6475

RADIOACTIVE CONTAMINATION MONITOR FOR THE PERSONNEL OF THE METALLURGY PLANT OF THE CISE. G. Giannelli, A. Lucchini, A. Malvicini and M. Pernice. Energia nucleare (Milan) 4, 24-32(1957) Feb. (In Italian)

6476

THE MEASUREMENT OF THE MOMENTA OF HIGH ENERGY CHARGED PARTICLES IN A DIFFUSION CLOUD CHAMBER. B. B. Culwick (Univ. of Birmingham, Eng.). J. Sci. Instr. 34, 154-8(1957) Apr.

The problems associated with the measurement of the momenta of high-energy nuclear particles in a diffusion cloud chamber are described. An optical system has been developed for which the apparent curvatures in the object due to distortion have an average value of 0.005 m^{-1} over the field of view. Spurious track curvatures due to convective gas motions within the cloud chamber are of similar magnitude, when a flash delay time adequate to allow the photography of the tracks of minimally ionizing particles in hydrogen is used. These figures result in a nominal accuracy of about 2% in the momentum of a 1000-Mev proton (momentum 1.7×10^9 ev/c) in a magnetic field of 1.3×10^4 G for tracks 20 cm long. The corresponding maximum detectable momentum is 8.5×10^{10} ev/c. (auth)

6477

A PHOTOGRAPHIC PERSONNEL DOSIMETER FOR X-RADIATION IN THE RANGE FROM 30 kev TO BEYOND 1 MEV. Margarete Ehrlich (National Bureau of Standards). Radiology 68, 549-54(1957) Apr.

6478

CHARACTERISTICS AND OPERATION MECHANISM OF GERMANIUM ELECTRON-HOLE ALPHA COUNTERS. A. V. Airapetyants and S. M. Ryvkin (Leningrad Physico-Technical Inst.). Zhur. Tekh. Fiz. 27, 95-105(1957) Jan. (In Russian)

The counting responses and mechanisms of pulse formation in Ge diodes were studied. It has been revealed that Ge n-p transitions of described block-scheme construction can be successfully used as α-particle counters and, also, for other heavy charged particles. It was observed that the pulse magnitude of Ge p-n transitions corresponded to the common dielectric counter and that pulse time increase for various oscillations was from 2 to 3 to 10 mc/sec. The n-p-transition counters are effective at room temperature as well as at exceedingly low temperatures. The force of the momentum and the expansion front relations to the outer chain parameters and the thickness of the base were analyzed. (R.V.J.)

6479

ON THE EFFECTS OF VISIBLE LIGHT SUB-ILLUMINATION ON THE PULSE HEIGHTS IN CADMIUM-SULFIDE α COUNTERS. A. V. Airapetyants and S. M. Ryvkin. (Leningrad Physico-Technical Inst.) Zhur. Tekh. Fiz. 27, 106-12(1957) Jan. (In Russian)

Attempts were made to show that a constant sub-illumination by visible light induces internal photoeffects which increase the conductivity. Comparisons were made of the CdS pulse magnitudes in relation to the increase of conductivity during sub-illumination by lights of various wave lengths and the CdS crystal heating. (R.V.J.)

6480

ON THE SHAPE OF ELECTRON PULSE IN IONIZATION CHAMBER. V. A. Dmitriev (Moscow State Univ.) Zhur. Tekh. Fiz. 27, 205-6(1957) Jan. (In Russian)

Measurements were taken of the shape of electron pulses in a cylindrical chamber with a positive tension on the central electrode. (R.V.J.)

6481

HELIUM FILLED PROPORTIONAL COUNTERS UNDER LOW TEMPERATURES. A. V. Kogan et al. (Leningrad Inst. of Physics in Technology). Zhur. Tekh. Fiz. 27, 429-31(1957) Feb. (In Russian)

The effectiveness of He-filled counters at various temperatures has been tested on specially constructed counters with adjustment for changes in the temperature and He pressures. The α particles of Po^{210} directed parallel to the filament were used to create the ionization impulse. The counter pulses were amplified by a linear amplifier with the upper pass band of 800 kilohertz and maximum cofficient of amplification 5×10^5. The error factor for temperature and compression measurements was $\pm$ 2%, therefore it has been assumed that at a given temperature a linear dependency exists between the gas density and the compression. To evaluate the densities at temperatures above 4.2°K, He was taken as an ideal gas, for densities at 4.2°K the vapor density of He was taken as p = 760 mm. (R.V.J.)

6482

IRE TRANSACTIONS ON NUCLEAR SCIENCE. VOLUME NS-3, NUMBER 4. SCINTILLATION COUNTER SYMPOSIUM HELD FEBRUARY 28-29, 1956 IN WASHINGTON, D. C. New York, The Institute of Radio Engineers, Inc., 1956. 144p.

Papers are included on recent developments in pulse height analyzers, multi-alkali photocathodes, the techniques and theory of fast coincidence experiments, transmission secondary electron multiplication for high-speed pulse counting, recent developments in multiplier phototubes, gaseous scintillation, scintillating solutions containing heavy elements, intrinsic scintillator resolution, the relative scintillation intensity of some Cherenkov counter media, temperature effects in gas-free liquid scintillators, high- and low-energy γ spectroscopy, neutron scintillation counters, the response of total absorption spectrometers to γ rays, transmission characteristics of light pipers, the background radiation detected by NaI crystals, in vivo γ measurements at low levels with 4 π liquid scintillation detectors, the physics of solid-state light amplifiers, high-output multiplier tubes with accelerator grids, time response in scintillation counting, measurements of photomultiplier transit time, and the peak efficiency of NaI(Tl) crystals for γ rays from 0.150 to 7.5 Mev. (B.J.H.)

MESONS

6483

THE VELOCITY DEPENDENCE OF ČERENKOV RADIATION FROM μ-MESONS. C. H. Millar and E. P. Hicks

(Atomic Energy of Canada Ltd., Chalk River, Ontario). Can. J. Phys. 35, 363-72(1957) Apr.

The intensity-velocity relationship of the Cherenkov light emitted by μ mesons passing through Plexiglas has been studied for the velocity range 0.83c to 0.99970c (84 Mev to 4.2 Bev). No departure of the observed from the theoretical intensity was found in the high-velocity region, in disagreement with the results of Bassi, Bianchi, and Manduchi (1952). In the low-velocity region slightly less radiation was observed than expected, but this is attributed to an optical effect in the apparatus rather than to a departure from theory of the Cherenkov light emission. (auth)

6484

DEPENDENCE OF π^0-MESON PHOTOPRODUCTION CROSS SECTIONS ON THE MASS NUMBER. B. B. Govorkov, V. I. Gol'danskiĭ et al. Doklady Akad. Nauk S.S.S.R. 112, 37-40 (1957) Jan. 11.

A series of experiments were carried out to determine the dependence of π^0-meson photoformation cross sections in a wide range of mass numbers. Special attention was devoted to the investigation of this dependence in the range of small A. A comparison was made of π^0 meson yield from liquid hydrogen, liquid nitrogen, and liquid oxygen poured into a cylindrical target of polystyrene. Two graphite targets placed inside of the polystyrene target were used in the experiment transition to heavier nuclei. The experiments were made with a 265-Mev synchrotron. To reduce the overload of separate counters and schemes of coincidences, the accelerator was adjusted by gradual attenuation of the amplitude. Data on bremsstrahlung spectra, γ quanta recordings, dependence of π meson photoproduction cross sections on the nuclear mass number, and the ratio of neutral and charged π-meson recharge cross sections are given in tabular and graphical forms. (R.V.J.)

6485

PRODUCTION OF π^+ MESONS ON CARBON BY 308 MEV π^- MESONS. V. V. Krivitskiĭ and A. A. Reut (Inst. of Nuclear Problems, Acad. of Sciences U.S.S.R.). Doklady Akad. Nauk S.S.S.R. 112, 232-5(1957) Jan. 11. (In Russian)

The meson-meson production process at energies close to the threshold of meson production were studied to determine the characteristics of π meson interaction with nucleons and mesons. The graphical scheme and the experimental procedures are described. A 308 ± 12 Mev π^--meson beam deflected by the synchro-cyclotron magnetic field passes through the collimator (50 mm in diameter and 2.7 mm long) and into the target (60 mm in diameter and 40 mm high graphite cylinder constructed along the collimator axis). Further, the π^- meson beam was deflected by an auxiliary magnet and controlled by a monitor consisting of two scintillation counters. π^- meson beams of 150 to 300 $cm^2\ sec^{-1}$ were used in the experiment. Records of π^+ mesons were made on the 280μ emulsion layer photoplates which were fastened to aluminum wedges. The photoplates recorded mainly the π^+ mesons escaping from the target at 90° angle to the π^- meson beam. The most of the observed $\pi-\mu$ fissions corresponded to the energies of the newly formed 30- to 50-Mev π mesons. (R.V.J.)

6486

MESON-NUCLEON PHASE SHIFTS OF SCATTERING IN ENERGIES UP TO 310 MEV. A. I. Mukhin, I. V. Popova, and G. N. Tentyukova. Doklady Akad. Nauk S.S.S.R. 112, 236-8(1957) Jan. 11. (In Russian)

Studies were made of meson-nucleon scatterings at ~ 200 to ~ 300 Mev with the purpose of observing meson interactions with protons in S, P, and D states. Analytical data are given on π^+ meson scattering on hydrogen with the assumption that its contribution to scattering in D states is neglibibly small, i.e. that the scattering occurs only in S and P states (S-P analysis) and with the assumption that its contribution to D states is considerable (S-P-D analysis). The tables for both S-P and S-P-D analysis and diagrams of the angular distribution of π^+ mesons elastically scattered on hydrogen are presented. (R.V.J.)

6487

ON THE INTERACTIONS OF FAST μ-MESONS. G. N. Fowler (Univ. of Manchester) and A. W. Wolfendale (Univ. of Durham). Nuclear Phys. 3, 299-306(1957) Apr.

The experimental and theoretical aspects of the production of stars and showers by fast μ mesons are reviewed. Difficulties are encountered in explaining the increase in cross section, with energy, for production of stars and showers with energy transfers of above about 400 Mev. These difficulties can be resolved if the Williams virtual photon method is assumed to be valid and if it is assumed that the photonuclear cross section has further resonances, above the π-meson resonance at about 300 Mev, corresponding to the production of heavy mesons or groups of π mesons. (auth)

METEOROLOGY

6488 AEC-tr-2905

DIMENSIONLESS CHARACTERISTICS OF TURBULENCE IN THE LAYER OF ATMOSPHERE NEAR THE GROUND. (Bezrazmernye Kharakteristiki Turbulentnosti v Prizemnom Sloe Atmosfery). A. S. Monin and A. M. Obukhov. Translated from Doklady Akad. Nauk S.S.S.R. 93, 257-60(1953). 11p.

NEUTRONS

6489 CF-57-3-128

Oak Ridge National Lab., Tenn.

ANISOTROPIC ELASTIC SCATTERING OF NEUTRONS. C. M. Copenhaver. Mar. 21, 1957. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The effects of including anisotropic neutron scattering in reactor calculations are briefly considered. More complete discussions are included on Legendre polynomial applications to electric scattering and the heat generated by elastically scattered neutrons. The equations developed are applied to the case of beryllium. (B.J.H.)

6490

A NEW METHOD OF MEASUREMENT OF NEUTRON POLARIZATION AND n—He^4 PHASE ANALYSIS. I. I. Levintov, A. V. Miller, and V. N. Shamshev (USSR Academy of Sciences, Moscow). Nuclear Phys. 3, 221-36(1957) Apr.

A helium analyzer for measurement of neutron polarization in the 1 to 18 Mev energy region is described. The efficiency of the analyzer in this region approaches 100%. The sensitivity of the instrument is approximately 20 cpm for a neutron flux of 10^5 neut/$cm^2 \cdot$ sec. The instrument operates practically without any background. The azimuthal asymmetry of 2.45 and 3.4-Mev (D + D) neutrons scattered on He^4 has been measured. Analysis of the result confirms the experimental phase shift values obtained by Seagrave and contradicts the phase shift values mentioned by Huber and Baldinger. (auth)

6491

DEPENDENCE OF (D + D) NEUTRON POLARIZATION ON DEUTERON ENERGY. I. I. Levintov, A. V. Miller, E. Z. Tarumov, and V. N. Shamshev (USSR Academy of Sciences, Moscow). Nuclear Phys. 3, 237-9(1957) Apr.

The polarization of (D + D) neutrons by thick and thin targets has been measured by a method described in the preceding paper for E_d lying between 0.6 and 1.8 Mev. (auth)

NUCLEAR PHYSICS

6492 AERE-Inf/Bib-90(Suppl. 1)

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

CHERENKOV RADIATION AND ITS PRACTICAL APPLICATIONS. A BIBLIOGRAPHY. J. E. Terry. Dec. 1956. 19p.

6493 NYO-6339

Yale Univ., New Haven. Sloane Physics Lab.

STUDY OF INTERACTIONS OF HIGH ENERGY PARTICLES WITH MATTER. Annual Report. Earle C. Fowler and Henry L. Kraybill. Mar. 1, 1957. 37p. Contract AT(30-1)-1469. $6.30(ph OTS); $3.00(mf OTS).

Progress in high-energy and cosmic-ray physics is reviewed. Some information is included on interactions of 2.5-Bev protons in Pb and C, the energy loss of 3- to 100-Bev muons in He, and the energy spectrum of neutrons produced in the forward direction by 2.2-Bev protons on Be. The nuclear emulsion program is reviewed. The design of a liquid propane bubble chamber is also discussed in some detail. Advances in bubble counting techniques are also discussed. Data are included on the production of heavy mesons and hyperons by protons on deuterium and on the production of L and K mesons and hyperons in 2-Bev p-p collisions. (B.J.H.)

6494 PR-P-32

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

PHYSICS DIVISION PROGRESS REPORT FOR OCTOBER 1, 1956 TO DECEMBER 31, 1956. 94p. (AECL-414).

The cosmic-ray neutron production in Pb was studied as a function of thickness. No anomalous rate of production of neutrons was observed for thicknesses from 60 gm cm^{-2} down to 4 gm cm^{-2}. Experiments on positron annihilation in liquid He are described. Decay properties of Np^{239} are also given. Instruments for the simultaneous presentation of coincidence spectra were developed and used to study the γ radiation spectra coincident with proton groups from $N^{14}(He^3,p\gamma)O^{16}$. Gamma rays from excited states in B^{11} were studied by coincidence techniques. A detailed study was also made of the reaction $B^{10}(He^3,p\gamma)C^{12}$. Information is also included on the reaction $N^{14}(He^3,p\gamma\gamma)O^{16}$. Progress in instrumentation is also reviewed. (For preceding period see PR-P-31.) (B.J.H.)

6495

VARIATIONS IN THE AMOUNTS OF POSITRONIUM FORMED IN LIQUIDS AND AMORPHOUS SOLIDS. R. E. Green and R. E. Bell (McGill Univ., Montreal and Atomic Energy of Canada Ltd., Chalk River, Ontario). Can. J. Phys. 35, 398-409(1957) Apr.

Measurements are reported of the intensity, I_2, of the long-lived (τ_2) component of positron annihilations in a number of liquids and amorphous solids. Large variations in I_2 have been found with different samples of similar substances. It is shown, for example, that I_2 for fused quartz of good quality is about 51% of all the positron decays, and that an earlier published value of 29% probably referred to a 96% silica glass rather than to pure fused quartz. The new value, taken with the results of angular correlation measurements, gives convincing evidence that the annihilation of triplet positronium in condensed materials proceeds mainly by the "pickoff" mechanism. It is shown that the addition of NO_3^- and NO_2^- ions to water in increasing concentration depresses I_2 from its normal value of (21 ± 5)% to a value at least as low as 2% without any marked change in τ_2. This behavior is explained in terms of the formation of the positron compound $e^+NO_3^-$ in the water. This hypothesis explains the shape of the curve of I_2 as a function of NO_3^- ion concentration and also gives a cross section for the capture of positrons by NO_3^- in rough agreement with expectation. (auth)

6496

BETA DECAY INTERACTION WHICH DOES NOT CONSERVE PARITY. Roger Nataf. Compt. rend. 244, 1917-18 (1957) Apr. 1. (In French)

6497

THE POLARIZATION OF 155 MeV PROTONS ELASTICALLY AND INELASTICALLY SCATTERED FROM CARBON. R. Alphonce, A. Johnsson, and G. Tibell (Univ. of Uppsala). Nuclear Phys. 3, 185-92(1957) Apr.

The polarization of 155-Mev protons elastically and inelastically (4.43-Mev level) scattered from carbon has been measured for angles up to 35° (lab. system). The energy spread of the protons was small enough to allow separation of energy levels by absorbers in a range telescope. The asymmetries were determined for two absorber settings, one corresponding to elastically scattered protons, and the other to elastically plus inelastically scattered protons. The elastic polarization rises from zero at 2° to a maximum of 99.5% at 21°, then goes through a minimum of −18% at 32.5° and reaches 28.4% at 35°. The inelastic polarization appears to increase from 59% to 96% in the angular region 16.2° to 27.4° and then to decrease to 2% at 35°. (auth)

6498

CONCERNING LIFETIMES OF LOW ENERGY E1 GAMMA TRANSITIONS IN ODD MASS SPHEROIDAL NUCLEI. Donald Strominger and John O. Rasmussen (Univ. of California, Berkeley). Nuclear Phys. 3, 197-206(1957) Apr.

A compilation of lifetime measurement data on low energy E1 transitions in odd-proton nuclei of the actinide region is given, and comparison is made with the single-particle lifetime formula. The comparison often shows a retardation of several orders of magnitude. Theoretical E1 matrix elements are calculated using Nilsson's spheroidal-well nucleon wave functions. The results show without exception a large retardation from the single-particle matrix elements. The selection rules in both the N, l, j, Ω representation and the N, n_z, Λ, Ω representation are considered. Quite generally in either representation selection rules forbid the combination of the large components of the wave functions with one another, and the various contributions of the small components to the E1 matrix element tend to cancel one another. (auth)

6499

A NOTE ON THE CALCULATION OF COULOMB PENETRATION AND COULOMB WAVE FUNCTIONS. R. M. Thaler and L. C. Biedenharn (Los Alamos Scientific Lab., N. Mex.). Nuclear Phys. 3, 207-12(1957) Apr.

The phase-amplitude method is applied to the calculation of Coulomb penetration and Coulomb wave functions. The methods discussed apply for $\eta = Z_1Z_2e^2/\hbar v > 1$. (auth)

6500

POLARIZATION OF HIGH ENERGY NUCLEONS EXCITING A COLLECTIVE LEVEL. A. J. Maris (Gustaf Werner Inst. for Nuclear Chemistry, Uppsala). Nuclear Phys. 3, 213-16 (1957) Apr.

For a spin-orbit coupling of the form $[\Delta V \times P]\cdot\sigma$, which reduces to the usual $(1/r)\,(dV/dr)\,l\cdot\sigma$ term for a spherical nuclear potential, it is shown that the polarization properties of neutrons scattered on nuclei are in the first Born approximation equal for elastic scattering and all collective excitations, and independent of the potential shape. (auth)

6501

A NOTE ON ROTATIONAL ENERGY LEVELS IN NUCLEI. F. Villars (CERN, Geneva). Nuclear Phys. 3, 240-54(1957) Apr.

It is shown that the kinetic energy T of any system of interacting particles may be written in a "canonical form," which displays the dependence of T on the total angular momentum. A formula is given for the zero order moments of inertia associated with collective rotation of the system. The formalism is applied to nuclei, and, for purposes of comparison, to molecules. In addition, it is shown that an unsymmetric formulation of the many particle problem, in which only the nucleons of a "core" participate in the definition of the body fixed axes, leads to a Hamiltonian which is related by a simple averaging process with the "unified" model of Bohr and Mottelson. Finally, a connection is established between the "unified" model of Bohr-Mottelson and the "cranking model" of Inglis. (auth)

6502

NUCLEAR SURFACES AND ZERO-ENERGY SCATTERING. D. C. Peaslee (Purdue Univ., Lafayette, Ind.). Nuclear Phys. 3, 255-61(1957) Apr.

The assumption of a diffuse nuclear edge introduces computational difficulties in optical model calculations. The present note discusses an approximation procedure for this case, in which the diffuse edge is replaced by an infinitesimally thin "effective edge" with appropriate reflection and transmission coefficients. Illustration is made with zero-energy neutron scattering, where the parameters $\langle \Gamma_n/D \rangle$ and $\langle a-R \rangle$ are both multiplied by the same factor T for any shape of diffuse edge. The empirical value is $T \approx 2$, corresponding to a total edge "width" of order 2×10^{-13} cm. (auth)

6503

STUDIES IN THE α-PARTICLE MODEL OF NUCLEI. IV. THE POLARISATION FORCES BETWEEN α-CLUSTERS IN NUCLEI. A. Herzenberg and A. S. Roberts (Univ. of Manchester). Nuclear Phys. 3, 314-35(1957) Apr.

The polarization forces between α particles are calculated for central forces between nucleons. There are two distinct possibilities to consider. The first is that the nuclear potential does not contain a direct part, when the polarization energy is the only source of an attraction between α particles. The Rosenfeld mixture is treated as an example of such a potential, and it is shown that the polarization energy due to this potential is too small to account for the attraction required by the α-particle model. The second possibility to consider is that the nuclear potential does contain a direct part, which is assumed to be attractive, when there is a direct attraction between α particles (analogous to the attraction between oppositely charged ions) which the polarization forces supplement. The Serber potential is treated as an example of a potential with a direct part, and it is shown that the polarization forces due to this potential cannot play more than a minor role in the attraction between α particles; however, the magnitude of the polarization energy is not negligible, and is of the order of the α-α binding energy per pair of nearest neighbors in the α nuclei. The distortion of α particles to which polarization gives rise may be interpreted as a tendency for the α particles to dissolve. The probability of solution is estimated, and is shown to be small for $A \leq 40$ even if polarization does provide most of the attraction between α particles, perhaps through the action of tensor forces. (auth)

6504

THE FINE STRUCTURE IN α DECAY OF EVEN-EVEN NUCLEI. V. G. Nosov. Doklady Akad. Nauk S.S.S.R. 112, 414-17(1957) Jan. 21. (In Russian)

It is shown that on the basis of existing data it is possible to calculate the deformation of α_2 in some nuclei. The values k, I, and w_2 were attained experimentally; two alternative values were used for the nuclear radius: $R_0 = 1.0A1/3 \times 10^{-3}$cm and $R_0 = 1.4A1/3 \times 10^{-3}$cm. The table of developed data is shown. The daughter nucleus quadrupole moment Q_0 can be verified by measuring the cross section of Coulomb excitation $0_+ \rightarrow 2_+$ or of the γ quanta emission probability $2_+ \xrightarrow{\gamma} 0_+$. (R.V.J.)

6505

PROGRESS IN NUCLEAR PHYSICS. VOLUME 5. O. R. Frisch, ed. New York, Pergamon Press, 1956. 329p.

The determination of nuclear reaction energies by deflection measurements is discussed in detail. Particular emphis is placed on energy selectors for ion beams and analyzers for reaction products. Work on the inelastic scattering of fast neutrons is reviewed. Discussions are included on neutron sources, flux measurements, experimental methods, and theory. A table of neutron cross section data is included in an appendix. Recent advances in electronic techniques in nuclear physics are also reviewed. In particular, cold cathode trigger tubes, decimal counting tubes, and transistors are discussed. The theory and operation of various types of bubble chambers are discussed. Discussions are also included on bubble growth and triggering devices. Methods for determining the radius of a nucleus are also reviewed. Work on neutrino emission phenomena is outlined. The properties of crystalline, liquid, and plastic organic scintillators are reviewed, and the scintillation process in organic scintillators is discussed. (B.J.H.)

6506

HIGH ENERGY NUCLEAR PHYSICS. PROCEEDINGS OF THE SIXTH ANNUAL ROCHESTER CONFERENCE, APRIL 3-7, 1956. J. Ballam, V. L. Fitch, T. Fulton, K. Huang, R. R. Rau, and S. B. Treiman, eds. New York, Interscience Publishers, Inc. 372p.

Papers are included on classical pion physics, nucleon-nucleon scattering below 500 Mev, theoretical nuclear physics, pion-nucleon and nucleon-nucleon interactions above 500 Mev, the properties of heavy mesons and hyperons, the production and interaction of heavy mesons and hyperons, the theoretical interpretation of new particles, mesonic atoms, electron-nucleon and photon-nucleon scattering, and miscellaneous topics. (B.J.H.)

NUCLEAR PROPERTIES

6507 AECU-3453

Los Alamos Scientific Lab., N. Mex.

FISSION THRESHOLDS FROM (d,p) STRIPPING REACTIONS. R. H. Stokes, Keith Boyer, and J. A. Northrop. [1957]. 3p. Contract [W-7405-Eng-36]. $1.80(ph OTS); $1.80(mf OTS).

In order to find fission thresholds from (d,p) stripping reactions, measurements were made of the total proton energy spectrum and of the energy spectrum of protons in coincidence with fission. Data for U^{235} and U^{238} are discussed. (B.J.H.)

6508 DP-194

Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.

TABLES OF EFFECTIVE NEUTRON CROSS SECTIONS IN WATER MODERATED REACTORS. H. Dean Brown. Jan. 1957. 35p. Contract AT(07-2)-1. $0.30(OTS).

Effective cross sections have been computed for nuclides that are exposed to neutrons moderated by H_2O or by D_2O. Tables are presented that show the effective cross section and the fraction of events below the cadmium cut-off energy as a function of moderator temperature and of effective reactor absorption. (auth)

6509 TNCC-2

Tripartite Nuclear Cross-Sections Committee. TRIPARTITE NUCLEAR CROSS-SECTIONS COMMITTEE — MINUTES OF THE FIRST MEETING HELD ON MARCH 12–14, 1956 AT CHALK RIVER, ONTARIO, CANADA. (TECHNICAL DISCUSSIONS). Apr. 13, 1956. 34p. $0.30(OTS).

6510 TNCC-4

Tripartite Nuclear Cross-Sections Committee. TRIPARTITE NUCLEAR CROSS-SECTIONS COMMITTEE — MINUTES OF THE SECOND MEETING HELD ON NOVEMBER 5–7, 1956 AT OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE, U.S.A. (TECHNICAL DISCUSSIONS). Dec. 7, 1956. 44p. $0.30 (OTS).

(See also TNCC-2.)

6511 AEC-tr-2888

COEFFICIENTS OF INTERNAL CONVERSION OF GAMMA RADIATION. PART I. K-SHELL. L. A. Sliv and I. M. Band. Translated from a Publication of the Academy of Sciences, U.S.S.R., 1956 (Moscow–Leningrad). 22p.

New tables of internal conversion coefficients are given for the conversion of γ rays in the K shell. Calculations of the coefficients took into account the finite size of the nucleus and the screening effect of the atomic electrons. Low-energy data are included. (B.J.H.)

6512 AEC-tr-2890

THE RATIO OF THE MAGNETIC SPIN AND QUADRUPOLE MOMENTS OF THE NUCLEI U^{233} AND U^{235}. N. I. Kaliteevskii and M. P. Chaika. Translated by L. Bovey from Optika i Spektroskopiya 1, 809-11(1956). 3p.

A reinvestigation was made of the hyperfine structure of the U^{235} lines. The spectrum was excited in a hollow cathode cooled with liquid air, and a Fabry Perot etalon was used. The ratio of the magnetic moments of U^{233} and U^{235} was found to be -1.6 ± 0.1. The ratio of the quadrupole moments was found to be $+0.8 \pm 0.3$. (B.J.H.)

6513

DETERMINATION OF THE γ TRANSITIONS IN THE REACTION $Mg^{24}(d,p)Mg^{25*}(\gamma)Mg^{25}$. Serge Gorodetzky, Marcel Port, Theo Muller, and Georges Bergdolt. Compt. rend. 244, 2041-4(1957) Apr. 8. (In French)

6514

INVESTIGATIONS OF THE NUCLEAR ISOMERISM IN Hf^{180m}. V. S. Gvozdev and L. I. Rusinov (Physico-Technical Inst., Acad. of Science U.S.S.R.) Doklady Akad. Nauk S.S.S.R. 112, 401-4(1957) Jan. 21. (In Russian)

Problems of multipole radiation were studied by measuring the internal conversion coefficient on the L shell in isomeric transition at 57.6 kev in Hf^{180m}. Measurements of electron spectra were taken on a β spectrometer with electron focusing at $\pi\sqrt{2}$ angle. Electron spectra for Hf^{180m}, Hf^{181}, and Ta^{181} in the energy range from 20 to 70 kev were measured to determine the α_L at 57.6 kev. The Hf^{180m} and Ta^{181} γ spectra in the energy range from 30 to 160 kev were analyzed to determine the number of Hf^{180m} γ quanta at 57.6 kev relative to the number of Ta^{181} γ quanta at 133 kev. The gamma spectrum for Hf^{180m} at 400 to 500 kev obtained by substracting the Ta^{181} γ spectrum from the Ta^{181} and Hf^{180m} was examined to find the Hf^{180m} decay scheme transitions at 1142.9 to 541.7 kev levels. The Hf^{180m} decay scheme is presented. (R.V.J.)

6515

THE HYPERFINE STRUCTURE OF PARAMAGNETIC RESONANCE. THE NUCLEAR SPIN AND MAGNETIC MOMENT OF THE 5.3-YEAR RADIOACTIVE ISOTOPE Eu^{152}. A. A. Manenkov, A. M. Prokhorov et al. Doklady Akad. Nauk S.S.S.R. 112, 623-5(1957) Feb. 1. (In Russian)

The nuclear spin and magnetic moment of 5.3-year radioactive Eu^{152}: $I(Eu^{152}) = 3./\mu_{152})/= 2.03$ nuclear magneton, were determined. Studies were made of the paramagnetic resonance in the SrS dust activated by europium containing 5.3-year radioactive Eu^{152} which formed from the natural mixture Eu^{151}(47.77%) and Eu^{153}(52.23%) irradiated by reactor neutrons. This irradiation produced a considerable yield of radioactive Eu^{151}, formed from Eu^{151} in reaction of $Eu^{151}(n,\gamma)Eu^{153}$. The initial mixture of Eu^{151} and Eu^{153} was exposed for 39 days to neutron flux 4×10^5 Specimens of phosphors SrS activated by mixture of Eu isotopes were developed by introducing $EuCl_2$ into the mixture of 2g $SrCO_3$, 1.5 g S, and 0.35 g $SrCl_2$, after which the mixture was dried and heated in the air at 1150°C for 20 min. The concentration of europium was $\sim 10^{-4}$. The spectrum of the hyperfine structure paramagnetic resonance in SrS · $Eu^{151, 152,}$ and ^{153} in electron transition $M = 1/2 \rightleftharpoons -1/2$ is shown in graphic form. (R.V.J.)

6516

EXCITED LEVELS IN Hg^{200} STUDIED FROM THE DECAY OF Tl^{200}. C. J. Herrlander (Nobel Inst. of Physics, Stockholm) and T. R. Gerholm (Univ. of Uppsala). Nuclear Phys. 3, 161-84(1957) Apr.

The half life of Tl^{200} has been found to be (26.1 ± 0.4) h. Conversion lines corresponding to 14 transitions in Hg^{200} were found. In addition, a few unidentified conversion lines were also observed. With the aid of coincidence spectrometer measurements, a level scheme was established, including the following excited levels: 368.0, 947.4, 1574.8, 1594.9, 1659.6, 1732.3, 1776.0, 1884.7 and 2136.7 kev. Conversion coefficients and K/L ratios were measured. The 368 and 579-kev transitions were found to be pure E2 transitions, suggesting the assignments 2+ and 4+ for the two first excited levels. For most of the other transitions in the decay-scheme, multipolarity assignments are discussed. A weak positron spectrum was also found in the decay of Tl^{200}, probably consisting of three components going to the ground state and the two first excited levels. The log ft-values of the two most energetic transitions are found to be 9.1 and 7.8, consistent with first forbidden transitions. The ground-state of Tl^{200} is 2−, and the mass excess, as calculated from our data, is (34550 ± 3020) μMU. Finally, the level scheme is compared with results of neutron-capture experiments on mercury. (auth)

6517

THE L/K-CAPTURE RATIO OF GERMANIUM 71. R. W. P. Drever and A. Moljk (Univ. of Glasgow). Phil. Mag. (8) 2, 427-36(1957) Apr.

A direct measurement of the L/K-capture ratio of Ge^{71} has been made using a special proportional counter system which avoids the effects of x-ray escape. One proportional counter is effectively enclosed by another, without any intermediate wall. With a gaseous source of germanium hydride and an argon filling at 6 atmospheres, the ratio of the L and K peaks from the central counter, in anticoincidence with the surrounding counter, was determined. The L/K-capture ratio was found to be $0.128^{+0.005}_{-0.005}$. In addition, in a separate measurement, a value of 0.53 ± 0.03 was obtained for the K-fluorescence yield of gallium. (auth)

6518

THE γ-RAYS FROM THE 8.06 MeV LEVEL IN ^{14}N. C. Broude, L. L. Green, J. J. Singh, and J. C. Willmot (Univ. of Liverpool). Phil. Mag. (8) 2, 499-504(1957) Apr.

Measurements were made of the intensity of the unfavored E_1 transition from the 8.06-Mev level in N^{14} to the 2.31-Mev level. A thin target of C^{13} was bombarded with 550-kev protons and the γ rays were observed at 0 and 90° to the proton beam with a scintillation spectrometer. Results are shown graphically. (B.J.H.)

6519

NUCLEAR ALIGNMENT OF ^{147}Nd. G. R. Bishop, M. A. Grace, C. E. Johnson, H. R. Lemmer, and J. Perez y Jorba (Clarendon Lab., Oxford). Phil. Mag. (8) 2, 534-40(1957) Apr.

Neodymium 147 has been aligned in a crystal of neodymium ethyl sulphate. The directional distributions and states of polarization of the 90- and 530-kev γ rays have been measured. It is concluded that both transitions are mixtures of M1 and E2 radiation (δE2/M1 = -0.17 ± 0.15 for the 90-kev and $+0.75 \pm 0.25$ for the 530-kev γ rays) and that the 530-kev state has spin $7/2^+$. From the 530 kev results a value for the nuclear magnetic moment of Nd^{147} of 0.44 ± 0.06 nuclear magnetons is found. (auth)

NUCLEAR REACTORS

6520 AERE-R/M-113

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

CRITICALITY OF COMPONENTS FOR H.A.R. P. N. Cooper. Jan. 1957. 15p. (HARD(A)/P-25).

The critical radii of pipes with an infinite water reflector and containing solutions of U^{235} in heavy water at 20°C have been calculated for uranium concentrations between 1 and 10 gm per liter. Also the critical radii of unreflected pipes containing U^{235}–heavy water solutions have been calculated for various temperatures between 20 and 300°C. A typical design of heat exchanger has been shown never to approach criticality over the range of working concentrations for a homogeneous reactor. The use of these calculations as a guide to the design of circuit components is discussed. (auth)

6521 ANL-5657

Argonne National Lab., Lemont, Ill.

REACTOR ENGINEERING DIVISION QUARTERLY REPORT—SECTION II [FOR] JULY, AUGUST, SEPTEMBER 1956. Dec. 1956. 69p. Contract W-31-109-eng-38. $0.40(OTS).

Experimental Breeder Reactor II. A study was made of the coolant flow characteristics of the primary system. A schematic diagram of the system is shown, and flow rates and pressure drops in the system are shown graphically. Data are also included on pump rectifier voltages. Illustrations are given of the pumps for the heat transfer systems. A preliminary test was made of the 5000-gpm Na pump using H_2O as the circulating fluid. A pump efficiency of 79% was obtained at the design flow rate. A test facility was constructed to determine the performance of a low-melting alloy, gas tight seal for the rotating plugs. Supporting and Alternate Design Research and Development. Calculations were made to investigate the reactivity effects of inhomogeneities in the ZPR-III facility. Calculation methods and results are described in detail. Heating tests were made on fissium alloy pins and the results are tabulated. Tests were made to evaluate gears and bearings for service in high-temperature Na. The apparatus used is shown and complete test results are tabulated. Experiments were also conducted on the Na–air reaction. (For preceding period see ANL-5601.) (B.J.H.)

6522 ANL-5697

Argonne National Lab., Lemont, Ill.

STYROFOAM SIMULATION OF BOILING AND TEMPERATURE EFFECTS IN THE EBWR COLD CRITICAL EXPERIMENTS. J. A. DeShong, Jr. Mar. 1957. 18p. Contract W-31-109-eng-38. $0.20(OTS).

Styrofoam was used successfully as a void material in the representation of hot reactor conditions during the EBWR zero power experiments. The void requirements were determined from available heat transfer data and then Styrofoam strips were designed and manufactured by special equipment. These strips were inserted in the fuel element water channels and the reactivity changes noted. The data were then converted to boiling and temperature coefficients. The nuclear properties of the material were excellent, and its use proved economical. The experimental accuracy was good, but probably could be improved by sealing the surface of the material against water absorption. (auth)

6523 ASAE-5

American Radiator and Standard Sanitary Corp., Redwood City, Calif.

EFFECTIVENESS OF REACTOR CONTROL ABSORBERS SENSITIVE TO NEUTRONS OF ALL ENERGIES. M. J. Nowak. Feb. 1, 1957. 35p. $0.30(OTS).

A criterion is established for the effectiveness of a reactor control absorber sensitive to neutrons of all energies from fission to thermal. This criterion can be used to determine an optimum alloy of absorber material, dependent on the absorption parameters of the elements and the slowing-down properties of the medium in which the absorber is used. The analysis is based on multigroup diffusion theory. The effectiveness of an absorber is defined as the change in power output (as measured by thermal neutron content) produced by insertion of the absorber into an infinite uniform source medium having the same flux spectrum as the reactor in which the absorber is used. The same criterion can also be derived from perturbation theory. A formula is developed for absorber effectiveness in terms of an equivalent diffusion length $\bar{L}$. It turns out that the effectiveness criterion for plate, cylinder, and sphere absorbers is basically different. For plate absorbers the effectiveness is independent of the thickness $R/\bar{L}$ of the plate but depends explicitly on the equivalent diffusion length. For this important case of cylindrical absorbers (control rods) the effectiveness depends on the size $R/\bar{L}$ of the absorber but is independent of the equivalent diffusion length. For spherical absorbers there is neither simplification and the effectiveness depends on both $R/\bar{L}$ and $\bar{L}$. This effectiveness criterion describes the intermediate case between the limiting conditions of weak absorbers and black absorbers, which are known from simpler theory. (auth)

6524 ASAE-9

American Radiator and Standard Sanitary Corp. Atomic Energy Div., Redwood City, Calif.

THE GENERAL CRITICAL REACTOR EQUATIONS. M. J. Nowak. Mar. 30, 1957. 19p.

A general formulation of the critical reactor equations is made to include space and velocity variation; the noncritical reactor is treated by using the effective multiplication factor. Two methods are developed for solving the general equation by splitting it into a pair of simultaneous equations: the space-energy split and the fission source split. By using unit sources one equation can be inverted to obtain a pair of integral equations for iterative solution of the general equation. The meaning of neutron importance is clearly defined, and the physical picture associated with the concept is given; its units are interpreted and elementary examples given. By using its physical meaning the importance balance equation, which is adjoint to the neutron flux equation, is derived by several methods. Neutron importance is used to formulate the change in reactor power produced by a change in reactor parameters. The effective multiplication factor and reactivity are introduced; the perturbation equation for reactor power change is developed in terms of reactivity. The necessary assumptions to derive the diffusion approximation are given,

and the general diffusion equation with continuous energy dependence is obtained. From this the multigroup diffusion equations can be obtained, including the multigroup diffusion perturbation equations. Besides this conventional multigroup treatment of the general diffusion equation the same methods used for the general critical reactor equation are applied to the diffusion equation to obtain its solution by splitting it into a pair of coupled integral equations. The integral equation for the effective multiplication factor is developed in terms of the fission source variable, and a stationary variational formula obtained for estimating the effective multiplication factor. (auth)

6525 BCM/WP-2

[Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England].

EFFECTIVENESS OF NEW EMERGENCY S.C. RODS IN B.E.P.O. C. C. Horton. Oct. 26, 1953. 2p.

The effect of thermal link and spring actuated emergency control rods in BEPO is calculated. For 4 rods of 3-in. diameter and 10-ft length placed in the corner holes of the thermal column, the control expected is 1.8% at least. For 12 rods of $1\frac{3}{8}$-in. O.D. and 13-ft length placed symmetrically on the circumference of a circle of 72.5-in. (10 pitches) radius horizontally, the control expected is 2.1% at most. (auth)

6526 CF-57-4-20

Oak Ridge National Lab., Tenn.

PRESSURE RISE IN HRT SHIELD DUE TO REACTOR AND REPLACEMENT HEAT EXCHANGER RUPTURE. J. C. Bolger, R. O. Maak, and E. H. Gift. Apr. 2, 1957. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Recalculations were made of HRT cell pressures in the event of a simultaneous rupture of the reactor core vessel and the fuel and blanket heat exchangers. These calculations will be applicable after the replacement fuel heat exchanger is installed. The pressure rise in the cell is plotted as a function of time. A maximum cell pressure of 34 psig is achieved ~7 sec after rupture. (B.J.H.)

6527 CRNE-551

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

THE TEMPERATURE COEFFICIENTS OF NRX AND ZEEP. PART A. TEMPERATURE COEFFICIENTS OF NRX. PART B. TEMPERATURE COEFFICIENT OF A ZEEP LATTICE. A. G. Ward. Dec. 1953. 71p. (AECL-375).

Experimental measurements of the uniform temperature coefficients of the NRX reactor, for both moderator and rod-assembly temperature changes, give the following results: for variation of moderator temperature (°C) $(2\alpha^2/h)\,(dh_w/dt) \times 10^7 = 0.52 - 5.0 \times (10^3/\rho_m)\,(d\rho_m/dt)$; for variation of rod-assembly temperature (°C) $(2\alpha^2/h) \times (dh_w/dt) \times 10^7 = 1.53 + 1.08 \times (10^3/\rho_w)\,(d\rho_w/dt)$. Combining these two results, the overall uniform temperature coefficient is given by: $(2\alpha^2/h)\,(dh_w/dt) \times 10^7 = 2.05 - 5.0 \times (10^3/\rho_m)\,(d\rho_m/dt) + 1.08 \times (10^3/\rho_w)\,(d\rho_w/dt)$ (Expt.). The calculated result, based on lattice theory and other data is: $(2\alpha^2/h)\,(dh_w/dt) \times 10^7 = 2.0 - 5.9 \times (10^3/\rho_m) \times (d\rho_m/dt) + 1.08 \times (10^3/\rho_w)\,(d\rho_w/dt)$ (Calc.). In both of these expressions, the coefficient of $(1/\rho_w)\,(d\rho_w/dt)$ has been chosen to agree with measured data on the critical height with and without cooling water in the rod-assemblies. The agreement of calculated and experimental values of the uniform temperature coefficient is better than the accuracy of the data used in the calculations would warrant. Experimental measurements of the uniform temperature coefficient of a Zeep lattice are compared with the calculated values. There is good agreement between calculations and experiment. For lattices of this type, with relatively large values of $\varkappa^2$, the leakage terms dominate the contributions to the temperature coefficient. Large corrections are required for changes of radial and vertical extrapolation lengths. (auth)

6528 CRRP-672

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

PREDICTION OF THE PHYSICAL PROPERTIES OF PTR. D. S. Craig and R. M. Pearce. Feb. 15, 1957. 74p. (AECL-426).

The critical masses, the fast and slow neutron flux distributions, and the fast and slow adjoint functions are calculated for eleven different loadings of PTR. The sensitivities of PTR to fissionable samples, absorbers, and voids are derived as a function of material and size of the internal thermal column. The mean neutron lifetimes are also calculated. (auth)

6529 CRT-359

National Research Council of Canada. Atomic Energy Project, Chalk River, Ont.

ON THE ANALYSIS OF FILTERED SWING MEASUREMENTS. V. H. Rumsey. Apr. 1948. 67p. (AECL-379).

This report deals with the following problem. Given a pile which has a small hole in its interior, the walls of the hole being lined with a neutron filter such as cadmium, it is required to analyze the effect on the pile reactivity of placing a neutron absorber in the hole. The theoretical model adopted is chosen to represent the following two physical processes which are responsible for the reaction of the absorber on the pile, i.e. the "swing" of the absorber is proportional to the integrated product of: the fraction of neutrons of a given energy which are absorbed (or emitted) by the sample—"the absorption effect," and the probability that the neutrons so captured would have taken part in the chain reaction if they had not been captured—"the fate effect." For this purpose a multigroup model is used such that the filter properties are effectively constant over the energy range covered by an individual group. The formula obtained for the neutron spectrum inside of the hole brings out the significance of the "absorption effect." There is a depletion of the spectrum at energies immediately below an absorption band of the filter, although the filter itself is perfectly transparent at such energies. This comes about because neutrons which are in the hole and have energies immediately below the absorption band, arise from neutrons which were within a short distance of the hole when they were being slowed down (in the surrounding moderator) through the absorption band. The formula for the swing brings out the "fate effect." It shows that the reaction on the pile of a given relative rate of capture is greatly reduced when the capture is greatly reduced when the capture takes place at energies just above an absorption band, because the neutrons captured would otherwise have probably been absorbed in the filter rather than the pile. A detailed analysis of measurements made with a cadmium tube placed along the pile axis occupies most of the report. A comparison with a two group model, (in which the energy dependence is smudged out) based on typical numerical values appropriate to the ZEEP, shows that the two group model applied to under cadmium swings: overestimates the value of η for a fission resonance of given absorption cross-section by about 20% if the resonance is at six times cadmium cut-off, the error being much greater if the resonance is closer to cadmium cut-off, and underestimates the fast fission yield (i.e. yield due to absorption at about 1 Mev) for a given absorption cross-section, by about 30%. The analysis explains why the cadmium

ratio obtained from swing measurements is much different from that obtained from activation measurements. For a typical arrangement, it is found that the cadmium shielded swing due to a resonance at, say, one hundred times cadmium cut-off, is only one half the unshielded swing due to the same resonance: for a resonance at twice cut-off there is a factor of 3.3 difference. For boron, it is found that the two kinds of cadmium ratio differ by roughly a factor of two. The numerical values quoted illustrate the deviation from the simple theory and are specific to a tube of one inch diameter: for a larger tube the deviations are greater. For a very small cadmium sphere, e.g. 1 cm radius, the deviations are only a few per cent. The deviation from equality of the two kinds of cadmium ratio for elements like boron (1/v law) or indium (single well defined resonance) provides new information about the physics of the pile, particularly with reference to the slowing down process at energies just above cadmium cut-off. The theory has been applied to analysis of experiments made to determine η for uranium 233, wherein a significant contribution from epithermal effects was discovered. (auth)

6530 HW-47707

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

SUCCESSIVE GENERATIONS DISADVANTAGE FACTORS. M. T. Lee. Dec. 20, 1956. 8p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Theoretical values of the disadvantage factor as predicted by the method of successive generations are given. (B.J.H.)

6531 IDO-16322

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

MAINTENANCE OF PRIMARY COOLANT WATER QUALITY IN THE MATERIALS TESTING REACTOR. J. H. Rainwater. Feb. 21, 1957. 55p. Contract AT(10-1)-205. $0.40(OTS).

MTR experience with regard to process water quality and radioactivity is presented. It has been found that fission products and U plate out on reactor components quite readily, thus creating a continuous source of fission products even though the original source of fission products is removed. Data are also given which show the effectiveness of using a cation resin bed in removing fission products from the system. Other general information is given on gas production and nitrogen fixation in MTR. (auth)

6532 KAPL-M-RCR-4

Knolls Atomic Power Lab., Schenectady, N. Y.

FLUX DISTRIBUTIONS IN SPIKED SLAB LATTICES. R. C. Rohr. Feb. 6, 1957. 22p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

A multiregion reactor technique was used to study three spiked lattices having a U to moderator volume ratio of approximately 2 to 1. Radial flux scans across all regions of the reactor are given for thermal, 5 ev, and 20 ev energies. Reactivity perturbations of the lattices on the reactor are also given. A technique for accurately measuring the neutron density distribution through the slabs and moderator is described. Parameters obtained from the data were the thermal utilization, η, fraction of power produced in the spikes, and flux ratios of the spikes and moderator to the natural U. (auth)

6533 NAA-SR-Memo-850

North American Aviation Inc., Downey, Calif.

OPERATIONS HANDBOOK FOR THE NORTH AMERICAN AVIATION, INC. RESEARCH REACTOR, MODEL L-3. Dec. 11, 1953. 174p. Contract AT-11-1-GEN-8. $1.10 (OTS).

The L-3 is a homogeneous solution type reactor commonly called a "water boiler." It consists of a core of highly enriched uranyl sulfate solution in H_2O contained in a stainless steel sphere surrounded by a graphite reflector. The steel tank which contains the core and reflector is encased in lead shielding, and the entire assembly is enclosed with concrete and timber shielding material. The reactor is designed for operation at a thermal power of 100 w and will supply a thermal neutron flux of approximately 4×10^9 neutrons/cm^2-sec in the experimental facility at the center of the spherical core. The cooling system, gas handling system, and instrumentation and controls are designed for ultimate operation at a power level of 2000 w. A complete listing of all the engineering drawings and blueprints, and a list of instruction manuals of the various components are appended. The reactor components are described in detail, along with complete operational characteristics and operating instructions. (auth)

6534 NAVORD-4286

Naval Ordnance Lab., White Oak, Md.

NOL REACTOR SAFETY PROGRAM. Paul M. Fye and E. C. Noonan. Apr. 30, 1956. 10p.

A proposed program of scaled studies of possible reactor incidents is described. Ordinary explosives will be used to provide a rapid release of the appropriate amount of energy. Scale ratios from 1/8 to full scale will be used and a study will be made of the properties of various materials which may be used in the construction of pressure vessels. A preliminary study was made of the Borax explosion using a linear scale factor of 1/8. The results were in line with other estimates of the energy release and equivalence to high explosives. (C.H.)

6535 NYO-7895

Pennsylvania State Univ., University Park. Coll. of Engineering and Architecture.

LOW POWER EXPERIMENTS WITH THE PENNSYLVANIA STATE UNIVERSITY REACTOR. W. M. Breazeale, R. G. Cochran, R. Misenta, G. Geisler, and W. Sjoborg. Sept. 1956. 44p. Contract AT(10-1)-2009. $0.30(OTS).

In August 1955, The Pennsylvania State University placed its research reactor facility in operation. A number of "low power" reactor experiments were carried out before the fuel elements were seriously activated. These experiments included measurements of critical masses with various loadings and reflectors, calibration of the control rod and safety rods, power level determinations, effect on reactivity of flooding a beam hole ending at the active lattice, effect of placing experimental apparatus against the lattice, etc. Results of this work are described. (auth)

6536 ORNL-2272

Oak Ridge National Lab., Tenn.

HOMOGENEOUS REACTOR PROJECT QUARTERLY PROGRESS REPORT FOR PERIOD ENDING JANUARY 31, 1957. Apr. 22, 1957. 198p. Contract W-7405-eng-26. $1.10(OTS).

Homogeneous Reactor Test. Modifications were made of the differential-pressure and O_2-metering systems. During operation, difficulties were encountered with erratic diaphragm-pump performance, ruptured diaphragm, valves, and faulty construction. Metallurgical inspection showed that cracks in the leak-detector system were caused by stress corrosion from chloride impurity. Amsco 125-82 was recommended as the secondary refrigerant, replacing Freon 11. The 400A-1 and 400A-2 pump continued to circulate 0.04 M UO_2SO_4 solution without difficulty. Testing operations of the HRT chemical processing plant was com-

pleted. Reactor Design and Analysis. Two-group, two-region nuclear calculations were extended for 10- and 12-ft-diam. spherical reactors containing $D_2O-ThO_2-U^{233}O_2$ in both core and blanket regions. Engineering Development. The high-pressure recombiner loop completed a run in which Ti and Zr were exposed. Experimental and calculated detonation pressures in the $H_2O_2-H_2O$ system are reported. A heat transfer system was constructed to check the validity of the Lawson heat transfer equation of slurries. A ThO_2-UO_2 slurry was prepared by simple mixing and circulated at 300°C in a 100 gpm loop. A 347 stainless steel valve was gold plated to improve corrosion resistance. Reactor Materials Research. Solution, slurry, and radiation corrosion of reactor components in various media are described. The stability of Zr, Nb, and Ti alloys at high-temperatures are discussed. Chemical Engineering Development. Experiments on UO_2SO_4 and ThO_2 blanket processing are reported. Nine slurries of ThO_2 were irradiated at 300°C in the LIRT and examined. Results are presented. Supporting Chemical Research. Temperatures of appearance of a second liquid phase were determined as a function of UO_2SO_4 and $CuSO_4$ concentrations in solutions. Results of experiments are reported for determining molecular and radical yield in D_2O. Analytical Chemistry. Progress is reported in the development and improvement of methods for use in the analysis of HRT fuels. (For preceding period see ORNL-2222.) (W.L.H.)

6537 WIAP-1z

Westinghouse Electric Corp. Industrial Atomic Power Group, Pittsburgh.

PROPOSED 200,000 KILOWATT PRESSURIZED WATER REACTOR PLANT. PLANT DESIGN AND COST ESTIMATE. Mar. 1955. Changed from OFFICIAL USE ONLY May 17, 1956. 99p. $1.85(OTS).

Results are summarized of a preliminary study of a pressurized light water nuclear power plant, having a reactor heat output of 800,000 kilowatts and a net electric output to system of 216,000 kilowatts. Steam for the turbine plant is produced at 600 psia dry and saturated. The fixed fuel element reactor core is located in a pressure vessel having an inside diameter of 102 inches and an over-all height of 25 feet. Reactor control is obtained with 19 neutron absorbing control rods. Supervision and control of the entire plant, including turbine-generator and electric distribution, is accomplished from a single central control room. Radiation monitoring equipment is applied to insure warning of plant malfunction, such as leakage of radioactive material or pile-up of contaminating materials, which might endanger plant or personnel. The 2000 psi primary system pressure is maintained by an electrically heated pressurizer which also serves as a system surge tank. Aside from a few special items, stainless steel and zirconium are the only materials in contact with the high temperature primary coolant. Emergency shutdown cooling, necessary in case of loss of auxiliary power, is obtained by utilization of steam driven pumps and release to atmosphere of steam generated in the main steam generators. This steam contains no radioactivity. Reactor unloading is performed under water and transfer of spent fuel to the storage tanks is accomplished along a water filled canal. The reactor is designed to utilize high or low enrichment cores with little or no modification of the plant. Future plant expansion is not considered since the primary function of the plant is to produce reliable nuclear power and to obtain operational data. Construction costs are minimized by using wherever possible standard equipment for all systems. The cost of the reactor, or steam producing plant is estimated to be $26,209,000 exclusive of nuclear fuel and certain site development costs, which are enumerated and which depend upon the site selection. The cost of the turbine-electric plant is estimated to be $17,280,000. Assuming 7000 hours equivalent full load operation per year and 14 per cent annual charge, an energy investment charge of 4 mills per kwhr is obtained. (auth)

6538

THE LIQUID-METAL-FUEL REACTOR CLOSED-CYCLE GAS-TURBINE POWER PLANT. L. D. Stoughton and T. V. Sheehan (Brookhaven National Lab., Upton, N. Y.). Mech. Eng. 78, 699-702(1956) Aug.

The design of a nuclear power plant is presented that combines the advantages of the closed-cycle gas turbine with those of the liquid-metal-fueled reactor. (T.R.H.)

6539

SITE ORGANIZATION AT CALDER HALL. J. F. Varcoe (Taylor Woodrow Construction, Ltd.). Nuclear Eng. 2, 135-8(1957) Apr.

The planning and organization carried out at the Calder Hall construction site is described. The handling of labor, materials, security, and co-ordination is discussed. (T.R.H.)

6540

THE NEW STATIONS. A DETAILED COMPARISON. Nuclear Eng. 2, 139(1957) Apr.

The Berkeley, South Scotland, and Bradwell power stations are compared. (T.R.H.)

6541

BRADWELL-ON-SEA NUCLEAR POWER STATION. 1. OPTIMIZATION OF THE N.P.P.C. DESIGN. R. D. Vaughan (N.P.P.C.). 2. GENERAL DESCRIPTION OF THE BRADWELL STATION. Nuclear Eng. 2, 140-5(1957) Apr.

The Bradwell Power Station incorporates some improvements over its prototype, the Calder Hall Station, which result in cheaper electric power. The pressure vessel will accomodate higher pressure and a larger core. Other modifications and a complete description are given and discussed. (T.R.H.)

6542

THE HOMOGENEOUS AQUEOUS REACTOR. I. Wells and D. Newby (A.E.R.E., Harwell). Nuclear Eng. 2, 146-51 (1957) Apr.

Homogeneous aqueous reactor systems are evaluated, compared, and discussed. Fuel cycles, heat removal, materials, and safety are some topics included. (T.R.H.)

6543

AN ELECTRONIC REACTOR SIMULATOR. Ross Cameron (Elliott Bros., Ltd., London) and D. A. Austin GEC Simon-Carves Atomic Energy Group). Nuclear Power 2, 146-51 (1957) Apr.

A full description is given of the computer designed and built by Elliott Bros. (London) Ltd for the GEC Simon-Carves Atomic Energy Group. (L.M.T.)

6544

REACTOR PHYSICS. 11. James F. Hill (Reactor School, Harwell). Nuclear Power 2, 157-60(1957) Apr.

A method for calculating the critical size of a reactor running at power by making allowances for the poisoning and temperature effects is presented. (W.L.H.)

Refer also to abstracts 6331, 6440, and 6489.

NUCLEAR TRANSFORMATION

6545 NP-6191

Uppsala. Univ.

SPALLATION OF MEDIUM WEIGHT ELEMENTS (thesis). Gösta Rudstam. 1956. 168p.

The present investigation deals with the spallation of

medium weight elements (mass number between 51 and 75) and may be summarized as follows. The cross sections of the spallation products have been measured for the following spallation reactions: vanadium, manganese, cobalt, and arsenic irradiated with 170-Mev protons; and arsenic irradiated with 103-Mev and 49-Mev protons. A new technique using small amounts of carriers (0.1 to 0.2 mg) has been used in the cross section determinations. The correction factors, used in converting the counting rate in a GM-counter to disintegration rate, have been studied. A mixture of the powdered target element and aluminum (or magnesium) powder has been used in the determination of absolute cross sections (by comparison with the known formation cross section of sodium-24 from aluminum or magnesium). Many half-life determinations have been carried out using the method of least squares. An empirical formula with four parameters has been found, which describes the cross sections of the spallation products, within a factor of about two on the average, for most spallation groups in the mass region in question. A theoretical study of the nucleon cascades developed in the target nucleus by high energy protons has been carried out using a Monte Carlo technique in essentially the same way as was done by Goldberger. The Monte Carlo technique has been used also for a study of the de-excitation of excited nuclei by evaporation of different particles. A combination of the cascade calculation and the evaporation calculation yields the absolute cross sections of the spallation products. These calculated cross sections have been compared with the experimentally determined ones. The agreement is good, which supports the model chosen for the spallation reactions. The cascade-evaporation calculation also gives information about the particles emitted in the reaction, namely their distributions in angle and energy. (auth)

6546 AEC-tr-2868

COLLISIONS OF DEUTERONS WITH NUCLEI. E. Lifshitz. Translated from Zhur. Eksptl'. i Teoret. Fiz. 8, 930-44 (1938). 22p.

Investigation is made of the collisions of deuterons with heavy nuclei accompanied by the disintegration of the deuteron with escape or capture of the neutron and proton particles produced. The effective cross section for such processes is computed as a function of the deuteron energy. The energy distribution of escaped particles is determined. (auth)

6547

PHOTONEUTRON EMISSION FROM Th^{232}, U^{233}, U^{238}, AND Pu^{239}. L. Katz, K. G. McNeill, M. LeBlanc, and F. Brown (Univ. of Saskatchewan, Saskatoon, Sask. and Atomic Energy of Canada Ltd., Chalk River, Ont.). Can. J. Phys. 35, 470-6(1957) Apr.

Measurements have been made of the numbers of neutrons emitted by the fissile materials Th^{232}, U^{233}, U^{238}, and Pu^{239} under irradiation by betatron x rays of various energies up to 23 Mev. Yield curves and corresponding cross section curves are given for these nuclides. At low x-ray energies it is found that the yield curves differ from those found with non-fissile heavy elements, corresponding to the fact that even at zero x-ray energy the fissile materials suffer (spontaneous) fission. (auth)

6548

ANGULAR DISTRIBUTION OF THE 8.34-Mev γ RADIATION FROM THE REACTION $N^{14}(p,\gamma)O^{15}$. Serge Gorodetzky, Andre Gallmann, Michel Croissiaux, and Raymond Armbruster. Compt. rend. 244, 1759-61(1957) Mar. 25. (In French)

6549

ON THE α PARTICLES EMITTED BY PHOTONUCLEAR REACTIONS IN COPPER, NICKEL, AND ALUMINUM. Georges Boulegue and Paul Chanson. Compt. rend. 244, 1761-3(1957) Mar. 25. (In French)

6550

ON THE INTERACTION OF ANTIPROTONS WITH NUCLEI. P. E. Nemirovskiĭ. Doklady Akad. Nauk S.S.S.R. 112, 411-13 (1957) Jan. 21. (In Russian)

The works of Segre' (Phys. Rev. 102, 1659 (1956) indicated that the cross sections of inelastic antiproton interactions with nuclei at antiproton energies of 300 to 500 Mev considerably exceed the cross sections of nucleon-nucleus interactions. For Cu at 450 Mev it was found $\frac{\sigma_h}{\sigma_H} = 1.5 \pm 0.5$ or 1.2 barns and, also, $\frac{\sigma_a}{\sigma_H} = 2.02$. For lighter nuclei at smaller energies this relation can be even higher as was revealed in studies with Be and glass. To verify the effect, experiments were made with deformed nuclei, and it was shown that antiproton cross sections can be reasonably explained considering the data on electron scattering by nuclei (Hahn et al., Phys. Rev. 101, 1131 (1956)) where proton density diminishes from 0.9 to 0.1 at distances of the order of $2.4 + 0.3 \cdot 10^{-13}$cm. (R.V.J.)

6551

ISOTOPES OF EMANATION PRODUCED BY BOMBARDMENT OF GOLD WITH NITROGEN IONS. A. W. Stoner and E. K. Hyde (Univ. of California, Berkeley). J. Inorg. and Nuclear Chem. 4, 77-83(1957) Mar.

Several emanation isotopes of very low neutron number have been prepared by bombardment of gold foil with 140-Mev nitrogen ions accelerated in the Berkeley 60-in. cyclotron. The alpha-decay properties of Em^{208}, Em^{207}, Em^{206}, and Em^{204} were measured. The alpha-decay to electron capture-decay ratios of Em^{208}, Em^{207}, Em^{206}, and of Po^{202} were determined. (auth)

6552

A SCINTILLATION SPECTROMETER STUDY OF THE PHOTODISINTEGRATION OF O^{16}. N. L. Svantesson (Univ. of Lund, Sweden). Nuclear Phys. 3, 273-98(1957) Apr.

The nuclear reactions $O^{16}(\gamma, p\gamma')N^{15}$ and $O^{16}(\gamma, n\gamma')O^{15}$ were used to study the photodisintegration of O^{16}. Various bremsstrahlung spectra with peak energies ranging between 16 and 30 Mev were used to excite the target nuclei. The photons emitted in the two reactions were measured with a NaI(Tl) scintillation spectrometer covering photon energies from 2 to 11 Mev. The results support the belief of the 6.1- and 6.3-Mev states in O^{15} and N^{15}, respectively, being $P_{\frac{1}{2}}^{-1}$ states. Transitions to these two states, 30 percent, are together with ground state transitions, 70 percent, the only ones observed between 20.0 to 22.5-Mev excitation energies. In the region between 22.5 and 25.0 Mev transitions to 7, 9, and 10–11 MeV states were also observed. Ground state transitions in this interval occurred in about 40 percent, while the transition probability to excited states was shared roughly equally between the 6.1- and 6.3-Mev states and all the other states, mainly the 7-Mev states. σ_{int} from 20 to 25 Mev amounted to about 0.1 Mev barn. The ratio between σ_{int} for (γ,p) and (γ,n) reactions was about 3:2. The nuclear elastic scattering of photons was also measured and was used to determine the integrated cross section for photon absorption up to 40 Mev which was found to be 0.3 Mev barn. (auth)

6553

AN ANALYSIS OF THE REACTIONS INDUCED IN COMPLEX NUCLEI BY NUCLEONS WITH ENERGIES BETWEEN 10 AND 20 MeV. G. Brown and H. Muirhead (Univ. of Glasgow). Phil. Mag. (8) 2, 473-90(1957) Apr.

Calculations have been made of the absolute values of the cross sections for processes of the type ${}_ZN^A(n,p\gamma){}_{Z-1}N^A$,

$_ZN^A(n,pn)_{Z-1}N^{A-1}$, $_ZN^A(n,n')_ZN^A$ and $_ZN^A(p,p')_ZN^A$, which have been induced by nucleons with energies between 10 and 20 Mev. It has been assumed that the target nucleus may be represented as a Fermi gas of nucleons, and that the nuclear processes proceed by direct interactions between the incident particle and the target nucleons, followed by the de-excitation of the nucleus; the ejection of a particle can occur during either process. Comparisons between the calculated and experimental data for the total cross sections, energy spectra and angular distributions of the emitted particles, indicate satisfactory overall agreement except for the process $_ZN^A(p,p')_ZN^A$. Empirical evidence is cited, which indicates differences in the level densities of the excited states of even-even, even-odd and odd-odd nuclei. (auth)

PARTICLE ACCELERATORS

6554 AERE-G/M-137

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

NUMERICAL CALCULATIONS RELATING TO A PROPOSED PROTON ACCELERATOR. P. M. Dyson and E. B. Fessey. June 26, 1952. 39p.

Calculations on the proposal to accelerate protons by using the Coulomb field associated with electron bunches are discussed, and the results are included to show the possibilities and limitations of the scheme. (auth)

6555 MURA-249

Midwestern Universities Research Assn., Madison, Wis.

THE RELATION OF EIGENPOLES TO BACK-WOUND POLES, RELUCTANCE POLES, AND OTHER DERIVED POLE STRUCTURES AND THEIR WINDIN' ERROR EFFECTS. D. W. Kerst. Mar. 29, 1957. 20p. Contract AT(11-1)-384. $4.80(ph OTS); $2.70(mf OTS).

Numerous ways of constructing iron and air core eigenpoles and derived poles are given. The required parameters of the reluctance pole are calculated. Curves are given showing $\Delta k/k$ resulting from a displaced section of the back-wound poleface winding as a function of the displacement and the amount of winding displaced. Displacement is treated as a dipole superimposed on a perfect poleface. The same calculation gives the effect of a displaced segment of a reluctance pole. (auth)

RADIATION ABSORPTION AND SCATTERING

6556 CEA-543

France. Commissariat à l'Énergie Atomique, Paris.

RELATION PARCOURS-ENERGIE DES IONS $3 < Z < 10$ DANS LES EMULSIONS NUCLEAIRES ILFORD C2. [Range-Energy Relations of Ions $3 < Z < 10$ in Ilford C2 Nuclear Emulsions]. A. Papineau. 1956. 14p.

6557 ORNL-2276

Oak Ridge National Lab., Tenn.

SOME ANALYTICAL SOLUTIONS OF THE SLOWING DOWN PROBLEM IN HYDROGEN. L. Dresner and A. Simon. Apr. 22, 1957. 18p. Contract W-7405-eng-26. $0.20(OTS).

Two situations are presented for which the slowing down problem in an infinite, hydrogenous medium can be solved explicitly in the P_1, B_1, and Selengut-Goertzel approximations. One case is for all cross sections constant, the other for a nonabsorbing hydrogen whose scattering cross section varies as v^3. The results are discussed in detail. (auth)

6558

INELASTIC SCATTERING OF FAST NUCLEONS BY THE LIGHT NUCLEI. I. BORN'S APPROXIMATION. Claude Marty and Philippe Meyer. Compt. rend. 244, 1893-5(1957) Apr. 1. (In French)

The angular distributions of inelastically scattered nucleons of some hundred Mev with excitation of one of the first levels of the target nucleus are calculated assuming a direct interaction mechanism for the reaction. Application is made to the excitation of the 4.43-Mev level of C^{12}. (tr-auth)

6559

PROTON RELAXATION IN H_2O-D_2O MIXTURES CONTAINING PARAMAGNETIC IONS. A. I. Rivkind (Kazan Physico-Technical Inst.) Doklady Akad. Nauk S.S.S.R. 112, 239-40(1957) Jan 11. (In Russian)

Measurements were taken of the longitudinal relaxation time of protons T, in solution in which the relaxation nuclei H, varied greatly due to the partial replacement of the H_2O by D_2O. Results obtained for the solution $MnCl_2$ 0.003 mol/l, $Cr(NO_3)_3$ 0.005 mol/l, $Cu(NO_3)_2$ 0.03 mol/l, and $CoSO_4$ 0.25 mol/l are presented in graphical form. The curves show a considerable T_0 time expansion with the reduction of proton concentrations and with 90% deuteron replacement of protons in the solution, $(\alpha = 0.9)T$, increases more than one unit of order value. (R.V.J.)

6560

ELASTIC AND INELASTIC SCATTERING OF HIGH ENERGY ELECTRONS BY SOME 2p-SHELL NUCLEI ON THE INTERMEDIATE COUPLING MODEL. M. K. Pal, S. Mukherjee, and A. K. Saha (Inst. of Nuclear Physics, Calcutta). Indian J. Phys. 31, 56-9(1957) Jan.

Scattering formulas are developed for 2p-shell nuclei using the intermediate coupling model. Preliminary calculations using these formulas are made of elastic and inelastic scattering of electrons by Be^9 and C^{12}. (B.J.H.)

6561

ALPHA–ALPHA SCATTERING AT 38.5 MeV. W. E. Burcham (Univ. of Birmingham, Eng.), W. M. Gibson (Queen's Univ. of Belfast), D. J. Prowse (Univ. of Bristol) and J. Rotblat (St. Bartholomew's Hospital, London). Nuclear Phys. 3, 217-20(1957) Apr.

A measurement of the angular distribution of the scattering of alpha particles by helium at 38.5 Mev is described. The c.m.s. cross section is 110 mb/steradian at 90°, falling to a very sharp minimum of about 0.5 mb/steradian at 64°. Approximate calculations of the phase shifts show that δ_0 and δ_2 are large and δ_4 small: these results are in agreement with other evidence for levels of spin 4 at about 11 Mev and of spin 0 and 2 near to 19 Mev. (auth)

6562

THE POLARIZATION OF 173 MeV PROTONS INELASTICALLY SCATTERED BY CARBON. H. Tyrén, Peter Hillman, and A. Johansson (Univ. of Uppsala). Nuclear Phys. 3, 336-9(1957) Apr.

Preliminary data are given on the polarization of 173-Mev protons inelastically scattered by C. Scintillation detectors in coincidence are used to detect the scattered protons, while an anticoincidence counter was used to detect the unscattered protons. (B.J.H.)

6563

ON THE SCATTERING OF HIGH-ENERGY ELECTRONS BY NUCLEI. J. Reignier (Univ. of Manchester). Nuclear Phys. 3, 340-3(1957) Apr. (In French)

The model dependence of the scattering of high-energy electrons is discussed on the basis of equivalence laws. It is shown that even at very high energies the angular distribution is insensitive to the central part of the density distribution, but can provide information about the surface region. (auth)

6564
RELATIVISTIC THEORY OF MESON-NUCLEON SCATTERING. S. F. Edwards and P. T. Matthews (Univ. of Birmingham, Eng.). Phil. Mag. (8) 2, 467-72(1957) Apr.

An effective range theory of low energy meson-nucleon scattering is developed based on the relativistic pseudoscalar interaction. An approximate relativistic equation is derived which, unlike the ladder approximation to the Bethe-Salpeter equation, preserves crossing symmetry. The equation is solved approximately and all divergences are removed by renormalization before going to the low energy limit. The resulting equations for the phase shifts depend on only one parameter, the coupling constant. With a suitable choice of this constant the p-wave phases, in particular that of the $^3/_2$, $^3/_2$ phase, are in good agreement with experiment. The s-wave phases are of the right order of magnitude, but do not show the observed strong dependence on isotopic spin. (auth)

RADIATION EFFECTS

6565 AEC-tr-2891
THEORY OF LATTICE DEFECTS. II. IRRADIATION OF SOLID CRYSTALLINE MATERIALS WITH BEAMS OF PARTICLES ("RADIATION DAMAGE"). A. Seeger. Translated from Handbuch der Physik. Crystal Physics, Pt. 1, 7, 431-50(1955). 20p.

A study of the effects of fast neutrons and other fast particles on the mechanical properties of solid bodies is presented. (W.L.H.)

6566 AERE-Lib/Trans-780
THE INVESTIGATION OF ENERGY EXCHANGE AND EXTINCTION PROCESSES IN GASES BY EXCITATION WITH FAST PARTICLES. (Results Obtained from Nitrogen and Gas Mixtures Containing Nitrogen). A. E. Grün and E. Schopper. Translated by N. Willis from Z. Naturforsch. 9a, 134-47(1954). 23p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 8-3560.

6567
SOME PHYSICAL PROPERTIES OF NATURALLY IRRADIATED FLUORITE. Robert Berman (Harvard Univ., Cambridge, Mass.). Am. Mineralogist 42, 191-203(1957) Mar.-Apr.

Five samples of purple fluorite found in association with radioactive materials, and a synthetic colorless control sample were studied and compared. Before and after heating, observations were made on specific gravity, index of refraction, unit-cell size, breadth of x-ray diffraction lines, and fluorescence. The purple samples became colorless on heating above 175°C. During the process, observations were made on color, thermoluminescence, and differential thermal analysis curves. There were strong correlations between the various physical properties, and it was found possible to arrange the samples in order of increasing difference in their physical properties from the control sample. This order apparently represents increasing structural damage by radiation; if so, it correlates with decreasing specific gravity, increasing index of refraction, broadening of x-ray lines, and increasingly strong exothermic reactions on annealing. The differences between the samples in index of refraction and x-ray pattern are largely eliminated on annealing. Annealing begins at 175°C; thermoluminescence at lower temperature is due to electrons escaping from the metastable potential traps, not the destruction of those traps which takes place on annealing. (auth)

6568
IN-PILE EXPERIMENTS WITH ORGANIC MODERATORS. Nuclear Eng. 2, 156-7(1957) Apr.

In-pile testing of biphenyl, 36% biphenyl–45% o-terphenyl–19% m-terphenyl, a 40% hydrogenated mixture of terphenyls, and monoisopropylbiphenyl is described. The latter one, MIPB, is recommended on the basis of the comparison. (T.R.H.)

Refer also to abstract 6272.

RADIOACTIVITY

6569
COMPARISONS OF NATIONAL RADIUM STANDARDS. T. P. Loftus, W. B. Mann, L. F. Paolella, L. L. Stockmann, and W. J. Youden. J. Research Natl. Bur. Standards 58, 169-74(1957) Apr.

The national primary Ra standards of the Federal Republic of Germany and the Dominion of Canada have recently been compared with the two United States national primary Ra standards at the National Bureau of Standards. The comparisons were made using the standard electroscope and radiation balance, and the results obtained for these four Hönigschmid standards have been compared with those obtained in an earlier comparison of the United States primary Ra standards with that of the United Kingdom, which is also a Hönigschmid standard. In every case, agreement with Hönigschmid's values to within 0.2% has been obtained. (auth)

6570
STUDY OF K AUGER ELECTRONS EMITTED BY ZINC 65. J. B. Bellicard and A. Moussa (Faculté des Sciences de Lyon) and S. K. Haynes (C.N.R.S., Bellevue). Nuclear Phys. 3, 307-13(1957) Apr. (In French)

Using a double focusing magnetic spectrometer with iron-free coils, the energies and relative intensities of the groups of K Auger lines of Cu^{65} resulting from the decay of Zn^{65} have been determined. (auth)

6571
RADIOACTIVE STANDARDS PREPARATIONS. C. F. Weiss. Berlin, Veb Deutscher Verlag der Wissenschaften. 1956. 232p. (In German)

RARE EARTHS AND RARE-EARTH COMPOUNDS

6572
RADIOACTIVE ISOTOPES OF RARE EARTHS FORMED IN SPALLATION REACTION. G. M. Gorodinski, et al. (Khlopin Radium Inst., Acad. of Sciences U.S.S.R.). Doklady Akad. Nauk S.S.S.R. 112, 405-6(1957) Jan. 21. (In Russian)

Determination of rare earth isotopes, the half lives, the type and energy of radiation and γ spectra taken with scintillation spectrometers with NaI(Tl) and CsI(Tl) crystals enabled a series of already known radioisotopes to be identified. New Gd isotopes were revealed and new gamma lines of the investigated nuclei were found. A short account of the obtained results is given in separate fractions for Ce, Ne, Eu, Gd, Tb, Dy, Yb, Lu, and fractions of Ho, Er, and Tm. (R.V.J.)

SHIELDING

6573 SWP/P-3
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
HEAT SOURCES IN SHIELDS. C. C. Horton. May 3, 1954. Decl. Dec. 6, 1956. 5p.

The sources of heat arising from nuclear radiation incident on various shield types are examined. Discussions are included on heat generated by γ radiation from the core and reflector, energy lost in neutron slowing down, and neutron-capture γ radiation. Consideration is

given to shields of Fe, Pb, B and Fe, and Pb and B. It is concluded that the heat generated in typical shields is largely due to thermal neutron radiative capture and that the heat generated per neutron incident on the shield is not very sensitive to the shield composition over typical shield mixtures. (B.J.H.)

6574
THE PROTECTION OF MULTICURIE STRONTIUM YTTRIUM (90) SOURCES J. L. Haybittle (Addenbrooke's Hospital, Cambridge, Eng.). Phys. in Med. and Biol. 1, 270-6(1957) Jan.

THEORETICAL PHYSICS

6575
THE FINE STRUCTURE AND LAMB'S SHIFT OF THE $2s_{\frac{1}{2}}$ LEVEL IN T_α TRITIUM LINE λ 6560 A. P. S. Kireev (Lomonosov Moscow State Univ.). Dokladv Akad. Nauk S.S.S.R. 112, 41-4(1957) Jan. 1. (In Russian)

The fine structure of the first line in the Balmer series in tritium T_α to λ 6560 A, the intensities of the components in the fine structure of this line, and the isotopic shift in the lines H_α to T_α were investigated. (R.V.J.)

6576
ON THE ROLE OF THE BOUND STATES IN PHOTOPRODUCTION PROCESSES. A. A. Logunov, B. M. Stepanov, and A. N. Tavkhelidze (Lomonosov Moscow State Univ.). Doklady Akad. Nauk S.S.S.R. 112, 45-7(1957) Jan. 1. (In Russian)

Dispersion ratios for meson photoproduction processes with account for the "bound" states and released unobserved energy regions were developed. The overall analysis of the dispersion ratios in the fixed source approximation produced results equivalent to G. F. Chew and F. E. Low, Phys. Rev. 101, 1579(1956). (R.V.J.)

6577
STRENGTH FUNCTION IN THE STATISTICAL THEORY OF NUCLEAR REACTIONS. Claude Bloch. Nuclear Phys. 3, 137-52(1957) Apr. (In French)

It is shown by means of a simple model that the strength function corresponding to a single particle state of a nucleon interacting with a nucleus has a Lorentz shape in agreement with the analysis of the complex potential model in terms of giant resonances. The value of the imaginary part of the complex potential obtained from this calculation is not directly related to the second moment of the strength function which can be derived from a sum rule. It may, in fact, be appreciably smaller than the root square of the second moment. (auth)

6578
K-MESON SCATTERING WITH CHANGE OF INTRINSIC PARITY. V. B. Berestetsky and Yu. A. Bychkov (USSR Academy of Sciences, Moscow). Nuclear Phys. 3. 153-6 (1957) Apr.

Theoretical consideration is given to the general properties of collisions between K mesons and nucleons in which the parity of the meson may change. For this discussion the K meson-nucleon wave function is represented as a combination of two spinors which transform differently on space inversion. (B.J.H.)

6579
ON INTERFERENCE PHENOMENA IN THE DECAY OF STRANGE PARTICLES. V. B. Berestetsky (USSR Academy of Sciences, Moscow). Nuclear Phys. 3, 157-60(1957) Apr.

A study was made of interference phenomena in the decay of various strange particles. In particular, consideration was given to the cascade decay $\Xi \rightarrow \Lambda^\circ + \pi_1^- \rightarrow p + \pi_1^- + \pi_2^- + \pi_2^-$ and to the cascade decay $\Sigma^\circ \rightarrow \Lambda^\circ + \gamma \rightarrow p + \pi^- + \gamma$. (B.J.H.)

URANIUM AND URANIUM COMPOUNDS

6580 AERE-M/M-64
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
A PROPOSED INVESTIGATION OF THE MECHANICAL PROPERTIES OF URANIUM ALLOYS. M. B. Waldron. Nov. 1953. Decl. Feb. 13, 1957. 8p.

A study of the influence of constitution on the mechanical properties of U alloys was made. Alloys with Mo and Zr are being examined in detail to follow the effects resulting from solution in the three modifications of U. Alloys with Fe, Si, Ta, and Al, are also included to investigate the effects of second phases having a variety of characteristics. (auth)

6581 AERE-T/M-133
Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.
BASIS FUNCTIONS FOR ELECTRONIC STATES IN α-URANIUM. D. F. Johnston. Mar. 1956. 27p.

Basis functions for a "tight-binding" calculation of the energy of electronic states in α uranium, based on s, p, d, f and g type orbitals, are classified into symmetry types. The factorization of the secular determinant for the electron energy is given for all symmetry points in k-space. (auth)

PATENTS

CHEMISTRY

6582
PRODUCTION OF RADIOACTIVE PHOSPHORUS. C. C. Evans and J. Stevenson (to U. K. Atomic Energy Authority). British Patent 765,489. Nuclear Eng. 2, 172(1957) Apr.

Refers to a method of separating radioactive P from neutron-irradiated S without a solvent extraction step. The P is subjected to distillation and the residue comprising the P is taken up with a mineral acid, preferably containing H_2O_2. The S may be distilled in the presence of an inert gas. The condensed S can then again be irradiated to produce a further batch of radio-phosphorus. (auth)

6583
METHOD OF SEPARATING PLUTONIUM. (To U. K. Atomic Energy Authority (Canada).) British Patent 765,924. Nuclear Eng. 2, 172(1957) Apr.

The Pu is to be separated from a mixture containing U and fission products, including Zr and Nb. This mixture is dissolved in HNO_3, then $Bi(NO_3)_3$ and $Zr(NO_3)_4$ are added as carrier compounds; insoluble phosphates of Pu, Zr, Bi, and Nb are precipitated from the solution by adding an aqueous solution of a phosphate. This mixed phosphate precipitate is now subjected to a treatment based on the known fact that $Bi(PO_4)_3$ is easily soluble in dilute HCl and on the discovery that, in such dilute HCl, plutonium phosphate and niobium phosphate are absorbed on zirconium phosphate but that plutonium phosphate may be leached from these other phosphates in HCl of a strength greater than 7N. (auth)

6584
SEPARATION OF COBALT AND NICKEL. M. de Merre (to Soc. Gén. Metallurgique de Hoboken). British Patent 766,720. Nuclear Eng. 2, 172(1957) Apr.

A precipitation is described of cobalt hydroxide from a mixed solution of cobalt and nickel sulfates or chlorides, in certain weight ratios and at a pH of 3 more, by means of nickelic hydroxide. The precipitate is separated and

dissolved and then treated so as to precipitate nickel as a cobalt-containing residue obtaining a solution containing cobalt with very little nickel and nickel with very little cobalt. (auth)

ENGINEERING

6585

LEAD DETECTION UNIT. A. Bell (to Foster Wheeler Ltd.). British Patent 765,239. Nuclear Eng. 2, 172(1957) Apr.

The detector unit at one of the danger points (e.g., a gland) comprises two chambers separated by a membrane. One of the chambers communicates with the sealing-gas space, the other with an indicating instrument. If liquid Na leaks from the system it contacts the membrane, which will be perforated, and the Na can then react with the sealing gas to form a smoke of oxide carried to the indicator. As a membrane, Klingerit 1000 is used. (auth)

6586

HEAT EXCHANGERS. N. Davey and W. J. Kramers (to U. K. Atomic Energy Authority). British Patent 766,668. Nuclear Eng. 2, 172(1957) Apr.

A block of sintered ceramic substance (alumina; beryllia; silicon carbide) is provided with groups of passages, one group of parallel passages in one direction, a second group in a direction transverse to the first group. The passages are arranged in layers and headers are connected to the separate groups. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

6587

PRODUCTION OF BERYLLIUM METAL. J. Williams and J. W. S. Jones (to U. K. Atomic Energy Authority). British Patent 765,692. Nuclear Eng. 2, 172(1957) Apr.

Beryllium metal produced by electrolysis of a molten electrolyte (beryllium and chloride ions) is refined by comminuting the metal to a particle size of about 10 microns, which is then leached with an aqueous solution of, for example, a polycarboxylic acid or an aromatic compound having one or more hydroxyl groups attached to the ring. After the leaching step, the Be is washed with hot water or treated with steam, then annealed in vacua at 500° to 800°C. (auth)

6588

URANIUM ALLOYS. E. W. Colbeck (to U. K. Atomic Energy Authority). British Patent 766,060. Nuclear Eng. 2, 172(1957) Apr.

The corrosion resistance of U metal can be markedly improved by including in the metal from 0.2% to 10%, preferably 1% to 6%, of its weight of Mo. Uranium metal and Mo are melted together, in the desired proportions, out of contact with air, under a flux or in vacua in a thoria crucible at 1,150°C to 1,400°C. The alloys may be subjected to an annealing treatment. No substantial competitive neutron absorption is introduced into the U metal by the Mo. (auth)

6589

URANIUM ALLOYS. E. W. Colbeck (to U. K. Atomic Energy Authority). British Patent 766,061. Nuclear Eng. 2, 172(1957) Apr.

The alloy includes 0.1% to 5% of its weight of Mo and 0.1% to 5% of its weight of Si. The alloys are prepared and may also be annealed in order to relieve stresses. In addition to the higher resistance to corrosion, the tensile strength of these alloys is greater than that of U, especially when annealed. (auth)

6590

THERMO-SETTING METAL ALLOYS AND PRODUCTION THEREOF. (To Rem-Cru Titanium Inc., (U.S.A.).) British Patent 766,626. Nuclear Eng. 2, 172(1957) Apr.

The conventional procedure for producing alloys of chemically reactive metals like Ti and Zr with other metals does not permit the imparting of intricate shapes; only rough forgings of rolled bar or sheet stock are obtainable. Any desired configuration can, however, be produced at extremely low pressures and temperatures and in precise dimensions in the following manner. A high melting metal (titanium; melting point 1,800°C) is admixed as a fine powder with a powdered low melting metal (tin; melting point 232°C) and the mixture heated to above the melting point of the low melting metal (250° to 300°C). A fluid paste is obtained of the unmelted Ti particles dispersed throughout the plastic Sn. At the same temperature (250° to 300°C), the paste is pressed or extruded and then kept at the temperature or raised to higher temperatures (1,200 to 2,000°F) until complete interdiffusion occurs. (auth)

PHYSICS

6591

GAMMA RAY DETECTOR. (To Texaco Development Corp., (U.S.A.).) British Patent 766,642. Nuclear Eng. 2, 172(1957) Apr.

In making radioactivity logs of formations in deep boreholes, temperatures exceeding 300°F may be encountered. It has been found that detectors of the electrical pulse-producing, gas-amplification counter type, which have a filling of argon and a small proportion of NH_3 as a quenching gas, require additional NH_3 at elevated temperatures, as otherwise no correct measurements are obtainable because of insufficient quenching of the counter, probably owing to decomposition of the NH_3 constituent into N_2 and H_2 increasing with the temperature. By the incorporation of an adsorbent for the ammonia within the sealed envelope for anode and cathode capable of releasing ammonia at the desired temperature, the efficiency of the detector can be increased over a wide range. As adsorbents, silica gel, activated carbon, alumina gel (Al_2O_3) and mixtures of alumina and silica gels are mentioned. (auth)

6592

DEVICE FOR DETECTING RADIATION. (To General Electric Co., (U.S.A.).) British Patent 766,726. Nuclear Engr. 2, 172(1957) Apr.

Radioactivity is measured on a fluorescent screen by which the radiation is converted into light flashes (plastic scintillation phosphor) which are integrated by a housing with a highly reflecting and diffusing coating (white magnesium carbonate paint). The light flashes impinge on the cathode of a photomultiplier tube connected to indicating and measuring means. (auth)